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ABSTRACT

The annotated bibliography formed by this and SE 013 620 is an extensive reference source for educators and researchers who teach and study secondary school mathematics. This volume lists 780 research reports found in the ERIC records and in 59 journals published in the United States from 1930 through 1970. The studies are listed under subdivisions of the following categories: Planning for instruction, Content: sequencing and structuring, Content: methods of instruction, Materials, Individual differences, Evaluating progress, Learning theory, Teacher education, Other post-secondary education, Mathematics, and References. Cross-references are given where studies fall into more than one category. For each entry, a code is used to describe the type of study, design paradigm, sampling procedure and size, statistical procedure, level, duration, and type of test. A short annotation describes the variables involved (where appropriate) and the major findings. Experimental studies for which full reports were available are evaluated using an instrument developed by the author. (MM)

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FINAL REPORT
Project No. 1-C-004
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ANNOTATED COMPILATION OF RESEARCH ON SECONDARY SCHOOL MATHEMATICS, 1930-1970

VOLUME 1:
INTRODUCTION
COMPILATION OF ARTICLES

Marilyn N. Suydam

The Pennsylvania State University
University Park, Pennsylvania 16802

February 1972

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

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ABSTRACT

The intent of the project was to provide, within limitations, a reference source for educators and researchers who teach and study secondary school mathematics.

1. A list of all reports of research which relate to the teaching of mathematics in the secondary school and which have been printed in journals published in the United States from 1930 through 1970 was compiled. A total of 780 research reports was found in 59 journals and in Educational Resources Information Center (ERIC) records.

2. A list of dissertations which were completed in the United States from 1930 through 1970 was compiled. A total of 770 dissertations was located.

3. Each study was analyzed and categorized by mathematical topic, type of study, design paradigm, sampling procedure and size, statistical procedure, level, duration, type of test, and variables (when appropriate).

4. Reports of experimental research were evaluated.

5. Each report and dissertation was annotated, with the major findings which appear to be supported by the data noted.

6. Pertinent data about the compilation were summarized.

PREFACE

Thanks are due to many people who assisted in developing this compilation. Florence Hammonds spent much time in the library, searching for appropriate reports. Beverly Brooks not only served as coordinating secretary, but also did much checking to ascertain accuracy. Kathy Harris and Joyce Axtell helped both with the collection and with the preparation of the final report. John Gregory, of the ERIC Center for Science, Mathematics, and Environmental Education, helped in analyzing some of the research reports, while Richard Swanson aided in the search for documents.

To them, and to the many unnamed, thank you . . . .

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VOLUME 1

INTRODUCTION
COMPILATION OF ARTICLES

I. Introduction

In 1967, a compilation of the research on elementary school mathematics, grades kindergarten through eight, was completed.[1]

In 1969, this was updated and made more inclusive.[2]

There still existed a need for a compilation of the research on secondary school mathematics. That is the purpose of these two volumes: to present a compilation of research articles and dissertations in which the teaching of mathematics in grades 7 through 12 is the focus.

This compilation, like those for elementary school mathematics, is more than just a bibliographic listing. Each report has been annotated, categorized, and evaluated. The intent is to provide, within limitations, a reference source for teachers in the secondary school, for teachers of teachers, and for researchers at both pre-doctoral and post-doctoral levels.

Need for Compilations of Research

The need for research has been noted increasingly, as we assess the status of the mathematics curriculum and of mathematics teaching. Many who plan research and development activities are not familiar with previous research. One of the difficulties which any researcher faces is locating those studies which will be of most use to him. As he begins to search in the literature, he finds that there is no one source of information on this research: he must spend time searching through many sources. Therefore a compilation can serve as a valuable tool. This compilation is categorized and annotated so that desired information can be located in a minimum amount of time.

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[1] Suydam, Marilyn N. An Evaluation of Journal-Published Research Reports on Elementary School Mathematics, 1900-1965. Unpublished doctoral dissertation, The Pennsylvania State University, 1967.

[2] Suydam, Marilyn N. and Riedesel, C. Alan. Interpretive Study of Research and Development in Elementary School Mathematics, Final Report, Phase I. U.S.O.E. Grant No. OEG-0-9-480586-1352(010). June 1969.

One other facet must also be considered: the need to evaluate research. We frequently read about studies that are not well-designed, or in which data are incorrectly gathered or analyzed, or where results are for one reason or another not applicable. Since research efforts vary widely in quality, the question of how much confidence can be placed in the findings of a study is one of considerable importance. An evaluation of reports of experimental research, which provides an indication of their current validity, is an essential aspect of this compilation. Such evaluation can serve as a guide to researchers and to others using the compilation.

Scope of This Compilation

The research reports and dissertations listed in this report all relate to secondary school mathematics education, grades 7 through 12. Some of these were included in the listing of research on elementary school mathematics; indeed, some of them were done with pupils in the elementary grades as well as from the secondary school. They are cited in this compilation as well to make it more comprehensive for secondary school educators.

The objectives for the project were:

1. To compile a list of reports of research printed in journals published in the United States, reports of research documented in the Educational Resources Information Center (ERIC) records, and dissertations completed in the United States between 1930 and 1970.

2. To analyze and categorize the research reports and dissertations by mathematical topic, type of study, design paradigm, sampling procedures and size, statistical procedures, level, duration, type of test, and variables.

3. To annotate the research reports and dissertations.

4. To evaluate each report of experimental research. (No evaluation of dissertations is given.)

5. To prepare a printed report which will make the compilation readily available to mathematics educators.

Limitations of This Compilation

This compilation has other limitations aside from those imposed by the scope. It is not complete, comprehensive, or free from error, despite attempts to make it so. The most serious limitation is due to human error. Undoubtedly some reports and dissertations were missed in the searching process, some were miscategorized and/or misfiled, and some details were overlooked and/or misread. The errors must and will be corrected as the compilation is used. Anyone who locates any errors can aid in this task by calling attention to them.

II. Procedures

It is easier to tell what was done than to describe the order in which it was done. Perhaps it is sufficient to indicate that all of the following were generally proceeding simultaneously!

A. Compiling a list of research reports and dissertations which were printed between 1930 and 1970 by:

   1. Searching appropriate journals and cross-checking this search by use of Education Index, Current Index of Journals in Education, previous partial listings, and references cited in articles.
   2. Searching ERIC lists, including Research in Education, for research projects.
   3. Searching Dissertation Abstracts and cross-checking this search with Dissertation Abstracts International Retrospective Index, previous partial listings, and references cited in articles.

B. Categorizing the research reports and dissertations; the categories are described in the following section.

C. Annotating and evaluating the research reports. These are parallel tasks: to do the first demands careful reading which facilitates the second. Only major findings which appear to be supported by the data were noted. This annotation was not intended to be an abstract of the study. The attempt was to present sufficient information so that the reader can decide whether or not to refer to the original study.

The _Instrument for Evaluating Experimental Research Reports_ was developed to serve as a tool in evaluating one significant type of research. Other types of research can also be evaluated, but time precluded such evaluation in this project. The comments and criticisms made by researchers through the years were collated; nine points were found to be repeated again and again:

1. Importance or significance of the problem
2. Definition of the problem
3. Design of the study
4. Control of variables
5. Sampling procedures
6. Use of instruments
7. Analysis of data
8. Interpretation of results
9. Reporting of the research

These nine points form the basis for the questions which comprise the instrument. In addition, certain "key points" are provided for consideration in ascertaining a rating for each question, with a pair of adjectives intended to focus the attention of raters on the same pertinent aspects of each question. The Instrument is included in Appendix E.

Two investigations of the degree of reliability of interrater agreement which could be expected in the use of the instrument have been reported.[3] In the first study, the interrater agreement was found to be .91, while the coefficient of reliability which provides a measure of the consistency probable with a single rater using the instrument is .77. In the second and more extensive study, the interrater agreement was .94, while the coefficient for a single rater was .57.

The instrument is used only with reports, not with abstracts. The limitations of abstracts make the reason for this evident: too little information can be provided in an abstract to assure valid use of the evaluation instrument.

D. Preparing this report. In the next section, a description of how to decode and use the compilation is given. This is followed by the annotated listing of journal articles and ERIC documents in this volume, and by the annotated listing of dissertations in Volume 2. Summaries of pertinent data are then given, and trends of the research briefly discussed. Each volume includes appendices; among these are alphabetical listings of articles and of dissertations.

Explanation of Coding for the Compilation

The format of the compilation parallels that used in the compilations on elementary school mathematics.[4, 5] The mathematical topic is indicated at the top of each page; the list of these topics, developed pragmatically from the subject and from the research may be found in Appendix A. The pages are grouped by topic, with studies listed in alphabetical order by author. Cross references are listed on the final page for each topic; only the author and the mathematical topic under which the reference may be located are cited. After each primary reference the major findings of the study are presented. When an annotation is not included, it is because the actual study or dissertation could not be located, although the reference indicates that it is pertinent to secondary school mathematics.

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[3] Suydam, Marilyn N. An Instrument for Evaluating Experimental Educational Research Reports. Journal of Educational Research 61: 200-203; January 1968.

[4] Suydam, 1967, op. cit.

[5] Suydam and Riedesel, op. cit.

When applicable, the primary independent and dependent variables are then noted. After this, there are two or three lines which present, when it is appropriate to the type of study and when ascertained from the report, information for the following nine categories:

1. Type of study: Many categories have been suggested by writers in the field of educational research. Similarities and differences from the definitions used by others may be noted. The definitions of descriptive, survey, case study, action, correlational, ex post facto, and experimental research used in this compilation may be found in Appendix B.

2. Design paradigm: The initial source of paradigms, or basic models which approximate a description of the procedures, was Campbell and Stanley.[6] However, modifications and additions were necessary in

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[6] Campbell, Donald T. and Stanley, Julian C. Experimental and Quasi-Experimental Designs for Research on Teaching. In Handbook of Research on Teaching. (Edited by N. L. Gage.) Chicago: Rand McNally and Co., 1963. Pp. 171-246.

order to classify actual research. Sparks[7] has given more precise explanations of each of the paradigms, which are listed in Appendix C.

3. Sampling procedure: Three essential factors to consider about sampling involve identification of (1) the population, (2) the sample and how it was selected, and (3) how treatments (if any) were assigned to the sample groups. These are presented by using the numeral which corresponds to the above aspect, and then a symbol: only, used after 1 when only the population was identified; r, for random; m, for matched; and s, for selected, used when no additional specific information was given.

4. Sample size: This is stated in terms of the total number of students and/or classes which were involved in analysis of the data.

5. Statistical procedure: The basic list of the types of statistical procedure or test used in a study was that proposed by Tatsuoka and Tiedeman.[8] As additional statistics were found in research reports, they were included in the list, which is presented in Appendix D. The basic division is between descriptive and inferential statistics. Descriptive statistics do not (readily) lend themselves to generalization, while this is one of the characteristics generally applied to inferential statistics.

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[7] Sparks, Jack N. Research Paradigms. Monograph prepared for Pennsylvania Department of Public Instruction, 1967.

[8] Tatsuoka, Maurice M. and Tiedeman, David V. Statistics as an Aspect of Scientific Method in Research on Teaching. In Handbook of Research on Teaching. (Edited by N. L. Gage.) Chicago: Rand McNally and Co., 1963. Pp. 142-170.

6. Grade level: The grade level of the pupils with whom the research was conducted is noted. When no grade level was specified, either age level or grade level to which the findings might be applicable were noted.

7. Duration: The time involved in conducting the research study is noted, with retention interval (if any) stated separately.

8. Type of test: "Norm" indicates that the test used in the study is a standardized instrument, for which data on a large sample or samples are available. "Non-norm" indicates a test for which such data are not available. In the majority of these cases, the test was constructed by the researcher.

9. Qualitative value: This information was obtained by application of the Instrument for Evaluating Experimental Research Reports. The sum of the numerical scores assigned to each question may be considered as a basis for some degree of comparison. A total of 9 to 12 would indicate that the report seems excellent in terms of the criteria; 13 to 20, very good; 21 to 28, good; 29 to 36, fair; and 37 to 45, poor. It should be recognized that the primary use of these scores should be to serve as an indication of the degree of validity to be expected from the findings as projected from the report.

The coding which is used in the compilation parallels the alphanumeric designations on the outlines of categories presented in Appendices A, B, C, and D. Dashes are used to indicate that information was not available, not applicable, or not located.

An example of how this information will be presented on the pages which follow is contained in Figure 1.

e; 3.4; 2-s, 3-r; 5 classes; 3.2; gr. 4; 5 wks.; norm;

27 (3, 2, 3, 3, 2, 4, 3, 4, 3).

Figure 1

CODED INFORMATION FORMAT FOR THE NINE CATEGORIES

Each bit of information refers to one of the nine points, in order. What this indicates is illustrated or interpreted in Figure 2.

	Information	Given "code"	"Translation" from lists
1.	Type of study	e	experimental
2.	Design paradigm	3.4	pretest-posttest, insufficient information about sampling
3.	Sampling procedure	2-s, 3-r	sample selected, randomly assigned to treatment
4.	Sample size	5 classes	5 classes
5.	Statistical procedure	3.2	analysis of variance
6.	Grade level	gr. 4	grade 4
7.	Duration	5 wks.	5 weeks
8.	Type of test	norm	normative test
9.	Qualitative value	27(3,2,3,3,2,4,3,4,3)	total value, 27; other numerals are those assigned to each question on the Instrument for Evaluating Experimental Research Reports

Figure 2

EXAMPLE OF DECODED INFORMATION FOR THE NINE CATEGORIES

Research Reports on Secondary School Mathematics

Historical developments (a-1)

Alspaugh, John W.; Kerr, R. D.; and Reys, Robert E. Curriculum Change in Secondary School Mathematics. Sch. Sci. Math. 70: 170-176; Feb. 1970. (ERIC Document No. EJ 015 668) (b-3, b-5)

Six trends were discussed: lowering of grade placement, teaching methods emphasizing understanding, introduction and deletion of content, integration of courses, emphasis on needs and characteristics of learners, increasing rate of curriculum change. Results of two surveys were cited to support these conclusions.

s; ---; 2-r; 233 teachers; 1.6; sec.; ---; ---; ---.

Butterweck, Joseph S. How Much Progress in Secondary School Geometry? Sch. Sci. Math. 37: 911-919; Nov. 1937. (c-23, d-1)

Geometry textbooks (1880-1937) were analyzed to determine their degree of reflection of social forces and educational philosophy and psychology. An increase in space devoted to definitions and on emphasis on applications in books published since 1928 are noted. Syllogistic proofs were used in nearly all books. Little or no change in the organization of the subject was found.

d; ---; ---; 33 textbooks; ---; gr. 10; ---; ---; ---.

Isenbarger, Katherine U.; *et al*. *A Half Century of Teaching Science and Mathematics*. 1950. (ERIC Document No. ED 011 839)

A fifty-year historical review of mathematics in the schools and for teacher preparation is given. Included are changes in courses, placement, teachers associations and publications, important committees and commissions, function of mathematics in education, and curriculum trends.

d; ---; ---; ---; ---; grs. K-12; ---; ---; ---.

McKee, Charles Lester. Historical Material in Secondary Mathematics. Sch. Sci. Math. 37: 588-597; May 1937. (d-1)

The amount of historical material in textbooks varied widely, with generally less material as level of mathematics increased. Authors and other educators generally treated such material only incidentally.

Historical developments (a-1)

d; ---; ---; 18 textbooks; ---; sec.; ---; ---; ---.

Other References

Beckmann, 1969	(f-2)
Dutton, 1968	(a-6)
Freeman, 1932	(d-1)
Heiges, 1930	(t-2b)
Jahn & Medlin, 1969	(a-7)
Johnson, A. W., 1936	(b-3)
Nietz, 1957	(r-2)
Olson, 1934	(d-1)

Sutton, Traver C. Science--Mathematics--Industry. *Sch. Sci. Math.* 45: 560-568; June 1945.

After a summer of factory work many teachers felt that several mathematics courses should be required for those employed in industry, though some felt it wasn't necessary to know mathematics to run a machine.

s; 1-only; ---; 69 teachers; 1.1; teachers; ---; ---; ---.

Turner, Claude F. What Need for Mathematics in Grade VIII? *Sch. R.* 45: 592-601; Oct. 1937. (a-6)

Reasons why students liked or disliked mathematics, out-of-school uses, and uses in other school subjects were tabulated.

s; ---; 2-s; 316 students; 1.1; gr. 8; ---; ---; ---.

Other References

Cassidy, June 1941b	(c-26)
Grossnickle, 1937	(f-1a)
Lyda & Franzen, 1945	(a-5b)
Moser, *et al.*, 1948	(r-2)
Richtmeyer, 1938	(t-2b)
Semmelmeyer, 1949	(d-7)
Welton, 1931	(f-1b)

Organizational patterns (a-3)

Baley, John D. and Benesch, Mary P. A System for Individualized Math Instruction in Secondary Schools. July 1969. (ERIC Document No. ED 050 555)

Multilevel team teaching and individualized instruction produced significantly higher student achievement in computational skills than did traditional methods.

a; ---; ---; ---; 1.5; sec.; ---; norm; ---.

Kellett, Jeremiah J. Bridging the Grade Six to Seven Gap with Continuous Progress. 1966. (ERIC Document No. ED 010 109) (d-2)

Seventh and eighth grade level self-study mathematics materials were given to sixth and seventh graders. The attitude of these students towards mathematics, and their mathematical achievement, showed no significant change.

(I) use of self-study materials. (D) achievement; attitude.

a; ---; ---; ---; ---; grs. 6, 7; ---; ---; ---.

Madden, J. Vincent. An Experimental Study of Student Achievement in General Mathematics in Relation to Class Size. Sch. Sci. Math. 68: 619-622; Oct. 1968. (c-21, f-2)

Achievement in general mathematics was significantly higher when students were taught in groups of 70-85, rather than groups of 25-40.

(I) class size. (D) achievement.

e; 3.21; 2-r; ---; 3.2, 3.3; gr. 9; 1 semester; norm; 24 (3, 3, 2, 4, 2, 3, 2, 3, 2).

Martens, Clarence C. Educational Achievements of Eighth-Grade Pupils in One-Room Rural and Graded Town Schools. El. Sch. J. 54: 523-525; May 1954. (e-5)

Students who had attended town schools for eight years had significantly higher arithmetic scores than students in rural schools had achieved.

(I) type of school. (D) achievement.

f; ---; 2-s; 148 students; 3.2, 3.5; gr. 8; ---; norm; ---.

Paige, Donald D. A Comparison of Team Versus Traditional Teaching of Junior High School Mathematics. Sch. Sci. Math. 47: 365-367; Apr. 1967.

Team teaching appeared to be more successful at eighth grade level than at seventh grade; eighth graders indicated they received more individual help in team classes. Neither grade indicated team teaching as a favorite form of instruction.

(I) team teaching or single-teacher methods. (D) achievement; retention; attitude.

a; ---; 2-m; 300 students; 2.6, 3.15; grs. 7, 8; 1 semester; ---; ---.

Steere, Bob F. An Evaluation of a Nongraded Secondary School. Final Report. Dec. 1967. (ERIC Document No. ED 018 003)

Graded students gained significantly more than students in non-graded schools in mathematics reasoning.

(I) graded or non-graded school. (D) achievement; attitude.

f; ---; 2-r; 141 students; 3.2; gr. 10; ---; ---; ---.

Sweet, Raymond and Dunn-Rankin, Peter. An Experiment in Team-Teaching Seventh Grade Arithmetic. Sch. Sci. Math. 62: 341-344; May 1962.

On the strength of the questionnaire and in the opinion of the instructors, it was noted that in spite of the disadvantages, team teaching seemed to be at least as favorable for arithmetic as the traditional self-contained classroom. No statistical data were reported.

(I) use of team teaching. (D) reactions.

a; ---; 2-s, 3-s; 70 students; ---; gr. 7; 1 semester; ---; ---.

Organizational patterns (a-3)

Thompson, William Hertzog. An Experiment with the Dalton Plan. *J. Ed. Res.* 26: 493-500; Mar. 1933. (a-4)

Students in the Dalton plan school gained .2 grade in arithmetic during the first session, while students in other schools gained .4 grade. In the second session, Dalton students gained .7, control school students, .5. (However, interpretation was difficult due to non-equivalence of groups and many variables.)

(I) Dalton plan or regular procedures. (D) achievement.

e; 3.22; 2-s, 3-m; 100 students; 1.3, 3.17; grs. 5-8; 2 summer sessions (8 wks. each); norm; 39 (4, 4, 5, 5, 5, 4, 4, 4, 4).

Willcutt, Robert E. Individual Differences--Does Research Have Any Answers for Junior High Mathematics Teachers? *Sch. Sci. Math.* 69: 217-225; Mar. 1969. (ERIC Document No. EJ 001 821) (e-4)

Achievement of students from self-contained classes was not significantly different from that in ability-grouped classes, though those in the ability-grouped classes had a more positive attitude. Other research on grouping practices was also summarized.

(I) type of class. (D) achievement; attitude.

e; 3.5; 2-s, 3-m; 156 students; ---; gr. 7; 1 yr.; norm, non-norm; 29 (3, 2, 3, 4, 3, 3, 5, 3, 3).

Other References

Anderson, K. E. & Dixon, L. J., 1952	(f-1b)
Archer & Woodlen, 1967	(a-4)
Goldberg, *et al.*, 1966	(e-3)
Layman, 1941	(e-5)
Reinoehl, 1934	(r-2)
Sax & Ottina, 1958	(b-5)

Amidon, Edmund and Flanders, Ned A. The Effects of Direct and Indirect Teacher Influence on Dependent-Prone Students Learning Geometry. *J. Ed. Psychol.* 52: 286-291; Dec. 1961. (a-6, c-23, f-4)

Achievement in geometry was not affected by clearness of perception of the learning goal. Those taught by the "indirect" teacher with discussions learned more than those taught by the "direct" teacher with lectures.

(I) direct or indirect teacher influence; clear or unclear goals; dependent-prone students. (D) geometry achievement; behaviors.

e; 2.12; 2-r, 3-s; 140 students; 1.4, 1.6, 2.6, 3.2, 3.3, 3.5; gr.

8; 2 hrs.; non-norm; 16 (2, 2, 2, 2, 2, 2, 1, 1, 2).

Archer, N. Sidney and Woodlen, Milton C. *The Teacher, Programed Materials, and Instructional Interaction--An Assessment of Five Selected Conditions of Teacher and Program Integration. Final Report.* May 1967. (ERIC Document No. ED 019 009) (a-3, c-22, d-5)

No significant differences in achievement or teacher and student attitudes were found for five types of teaching strategies used in programs. Teacher attitude affected student attitude, however.

(I) modern or traditional program; rigid to flexible organization of classroom. (D) achievement.

a; ---; ---; ---; ---; gr. 9; 1 yr.; ---; ---.

Austin, Gilbert R. *A Longitudinal Evaluation of Mathematical Computational Abilities of New Hampshire's Eighth Graders: 1963-1967. Final Report.* Aug. 15, 1969. (ERIC Document No. ED 039 147) (d-1, f-2)

Analysis of eighth grade scores from 1967 tests indicated that the introduction of modern mathematics was "somewhat responsible" for the decline in computational ability. Computational ability of 1965 eighth graders as 1967 tenth graders did not appear to be significantly different for groups using modern, transitional or traditional textbooks. A group of tenth graders who had used a modern or transitional textbook did markedly superior work in algebra and geometry than those who had used a traditional textbook.

(I) type of textbook used. (D) computational ability.

f; ---; 2-s; ---; ---; grs. 8, 10; ---; norm; ---.

Teaching approaches (a-4)

Belcastro, Frank P. Programmed Learning and Intelligence. Sch. Sci. Math. 66: 29-36; Jan. 1966. (c-22, d-5, f-2b)

The program in which algebra was presented using a verbal deductive technique resulted in higher achievement at each intelligence level.

(I) programs using verbal or non-verbal, inductive or deductive presentations. (D) achievement.

e; 2.12; 2-m, 3-r; 454 students; 1.4, 1.5, 3.2, 3.20; gr. 8; 3 days;

non-norm; 19 (3, 2, 2, 2, 1, 4, 1, 2, 2).

Belcastro, Frank P. Relative Effectiveness of the Inductive and Deductive Methods of Programming Algebra. J. Exp. Ed. 34: 77-82; Spring 1966. (c-22, d-5)

The deductive method was found to be significantly better than the inductive method and the verbal mode was significantly better than the non-verbal mode on achievement, but no significant differences were found on an applications subtest.

(I) programs using verbal or non-verbal, inductive or deductive presentations. (D) achievement and applications scores.

e; 2.12; 2-m, 3-r; 378 students; 3.2; gr. 8; 3 days; non-norm;

22 (3, 2, 2, 2, 2, 4, 2, 2, 3).

Bhushan, Vidya; Jeffryes, James; and Nakamura, Irene. Large-Group Instruction in Mathematics Under Flexible Scheduling. Math. Teach. 61: 773-775; Dec. 1968. (c-23)

Students learned equally well with a form of large-group instruction as with usual-sized groups.

(I) two organizational patterns. (D) achievement.

a; ---; 1-only; 112 students; 1.4, 3.5; grs. 9, 10; 1 semester;

norm; ---.

Broussard, Vernon; Fields, Albert; and Reusswig, James M. A Comprehensive Mathematics Program. AV Inst. 14: 43-44, 46; Feb. 1969. (ERIC Document No. EJ 001 360) (e-2a)

A program for low achievers from disadvantaged areas which emphasized real-world applications and use of flow charts, calculators, and other materials, resulted in significant achievement gain. Sixty per cent of the students who had participated in the program continued to take mathematics courses, compared with 40 per cent in a control group.

(I) special program. (D) achievement.

a; ---; 1-only; 12 classes; ---; grs. 7-9; ---; ---; ---.

Brownman, David E. Measurable Outcomes of Two Methods of Teaching Experimental Geometry. J. Exp. Ed. 7: 31-34; Sept. 1938. (c-23)

The individual laboratory method was superior to the lecture-demonstration method with respect to test scores and experimental concepts, but the superiority is not as marked for skills. The methods were comparable for applications and integrated problems.

(I) lecture-demonstration or individual-laboratory method.
(D) achievement; retention.

e; 3.5 r; 2-m, 3-m; 100 boys; 1.4, 1.5, 3.15; grs. 9, 10; (retention, 1 mo.); non-norm; 27 (2, 3, 3, 3, 3, 4, 3, 3, 3).

Brydegaard, Marguerite. The Insatiable Quest: Mathematicking. Arith. Teach. 7: 9-12; Jan. 1960. (c-4, t-1b)

Emphasis on understanding of concepts of division and multiplication of fractions resulted in substantial decrease in the number of incorrect responses.

(I) emphasis on understanding. (D) achievement.

a; ---; 1-only; 657 students; 1.6; grs. 4-8, pre-service; 2 wks. (retention, 1 wk.); non-norm; ---.

Teaching approaches (a-4)

Campbell, Vincent N. Self-Direction and Programed Instruction for Five Different Types of Learning Objectives. Psychol. in Sch. 1: 348-359; Oct. 1964. (a-5i, c-12, c-21, d-5, g-4, g-5)

Lower-ability students did not significantly differ in achievement, retention, or time on self-directed or linear mathematics programs. For high-ability students, self-direction was significantly superior after, and only after, coached practice in self-direction.

(I) type of program; type of feedback. (D) achievement.

e; 2.8 r; 2-s, 3-r; 2 classes (I), 34 students (II); 1.4, 1.5, 3.5;

gr. 9; 8 days (retention, 1 mo.); non-norm; 23 (3, 2, 2, 2, 3, 3,

3, 2, 3).

Cassel, Russell N. and Jerman, Max. A Preliminary Evaluation of SMSG Instruction in Arithmetic and Algebra for 7th, 8th, and 9th Grade Pupils. Calif. J. Ed. Res. 14: 202-207; Nov. 1963. (c-10, d-1, f-2)

This preliminary evaluation of SMSG instruction was based largely on a comparison of test scores for students enrolled in SMSG courses with corresponding scores for matched students in traditional courses. SMSG students for grades 7, 8, and 9 had statistically significantly higher arithmetic and algebra test scores than the matched students.

(I) SMSG or traditional instruction. (D) achievement.

f; ---; 2-s, 3-s,m; 262 students (9 classes); 1.4, 3.4; grs. 7-9;

---; norm; ---.

Collings, Ellsworth. Learning the Fundamentals in the Activity Curriculum. J. Exp. Ed. 1: 309-315; June 1933.

Students taught by an activity curriculum achieved higher scores on all arithmetic measures than students from a conventional subject curriculum.

(I) activity or conventional curriculum. (D) achievement.

f; ---; 2-s, 3-m; 128 students; 1.4, 1.5; gr. 7; ---; norm; ---.

Cronin, Robert Emmet. The Effect of Varying Amounts of Traditional and Modern Mathematics Instruction Relative to Sex and Intellectual Ability on Both the Traditional and Modern Mathematics Achievement of Eighth Grade Pupils. *Catholic Ed. R.* 65: 548-549; Dec. 1967. (e-6, f-2a, f-2b)

Confusion or interference from a change in method of instruction does actually exist; its debilitating effects are retroactive and proactive.

(I) change in method of instruction. (D) achievement.

f; ---; 1-only; ---; ---; gr. 8; ---; ---; ---.

Crosby, Gwladys; *et al.* *Mathematics Individual Learning Experiment.* 1960. (ERIC Document No. ED 003 558) (c-22)

A significant drop in attitude was found for groups taught by individualized or traditional instruction; no significant differences in achievement were found.

(I) individualized or traditional instruction. (D) achievement; attitude.

e; 2.3; 2-r, 3-r; 36 classes; ---; gr. 9; ---; ---; ---.

Davidson, Walter W. and Gibney, Thomas C. Evaluation of a Modern Mathematics Program. *Sch. Sci. Math.* 69: 364-366; May 1969. (ERIC Document No. EJ 003 661) (f-2c)

A group that had modern mathematics instruction in grade 8 was found to differ significantly (from those who had regular instruction) in eight high school courses in science and mathematics.

(I) type of background. (D) achievement.

f; ---; 1-only; 9 classes; 2.6, 3.3, 3.5; gr. 8; ---; norm; ---.

Della-Piana, Gabriel M.; *et al.* *Sequence Characteristics of Text Materials and Transfer of Learning, Part I--Experiments in Discovery Learning.* Dec. 1965. (ERIC Document No. ED 003 346) (b-3, d-5)

Guided discovery sequencing and method were superior to exposition in transfer effects and retention of concepts.

Teaching approaches (a-4)

(I) type of sequence. (D) achievement; transfer; retention.

e; 3.8 r; 1-only; 96 students; 1.4; grs. 5, 6, 9; ---; ---; ---.

Drake, Richard. A Comparison of Two Methods of Teaching High School Algebra. J. Ed. Res. 29: 12-16; Sept. 1935. (c-22, e-4)

Students taught by a group method involving individual study achieved significantly higher scores than those doing individual work at their own rate.

(I) individual or individualized group method. (D) achievement.

e; 3.8; 2-m, 3-s; 2 classes (44 students); 1.4, 3.4; gr. 9; 1 yr.;

norm, non-norm; 24 (2, 2, 3, 4, 3, 3, 3, 2, 2).

Ericksen, Gerald L. and Ryan, James J. A Study of the Effects of Experimental Programs on Pupil Achievement Observed During First Three Years of the Project, Secondary Mathematics Evaluation Project. Interim Report. Nov. 1966. (ERIC Document No. ED 011 977) (d-9)

Few significant differences were found between students instructed by different modern programs. Initial student ability was the most significant factor involved in achievement and retention.

(I) modern or conventional program. (D) achievement; retention.

e; 3.3 r; 2-s, 3-r; ---; ---; sec.; ---; ---; ---.

Fitzgerald, William M. Self-Selected Mathematics Learning Activities. 1965. (ERIC Document No. ED 003 348) (f-2b)

Bright students (115 IQ and over) did not learn as much in the self-selection classes as did those in the conventional classes. Slower students (114 IQ and below) learned equally well in both classes.

(I) self-selection or conventional procedure; IQ. (D) achievement.

e; 3.4; ---; 271 students; 6.4; grs. 7, 8; ---; ---; ---.

Friebel, Allen C. Measurement Understandings in Modern School Mathematics. Arith. Teach. 14: 476-480; Oct. 1967. (c-8, d-9)

Students taught with SMSG materials maintained achievement similar to those in the traditional program, but achieved significantly superior growth in arithmetic reasoning and on measurement.

(I) SMSG or traditional program. (D) achievement.

e; 2.4; 2-s, 3-r; 171 students (6 classes); 1.4, 2.6, 3.2, 3.4;

gr. 7; 1 yr.; norm, non-norm; 19 (2, 2, 3, 2, 1, 3, 1, 3, 2).

Gibbs, Doris and Brgoch, Ann. Individualizing Mathematics in the Small School. 1964. (ERIC Document No. ED 036 365) (d-1, d-5)

Two teachers found that use of multi-level textbooks and programmed materials aided in individualizing instruction.

(I) individualized instruction. (D) achievement.

a; ---; 1-only; 2 classes; 1.10; grs. 7, 9; 1 yr.; norm; ---.

Henderson, Kenneth B. and Rollins, James H. A Comparison of Three Stratagems for Teaching Mathematical Concepts and Generalizations by Guided Discovery. Arith. Teach. 14: 503-508; Nov. 1967. (c-11, d-5, g-3)

Three inductive stratagems were found to be effective in teaching concepts and generalizations.

(I) three inductive stratagems. (D) achievement.

e; 2.16; 2-s, 3-r; 150 students; ---; gr. 8; 3 days; norm, non-norm;

29 (1, 3, 4, 3, 2, 3, 5, 4, 4).

Hirschi, L. Edwin. An Experiment in the Teaching of Elementary Algebra. Sch. R. 66: 185-194; June 1958. (c-22)

No significant differences between groups taught by a formal or informal approach were found on a standardized test; on the specially developed test, the informal group scored significantly higher, especially for above-median students.

Teaching approaches (a-4)

(I) formal or informal classroom structure; ability. (D) achievement.

e; 3.5; 2-s, 3-m; 120 students (6 classes); 3.2, 3.3, 3.4, 6.4;

gr. 10; 1 yr.; norm, non-norm; 21 (3, 1, 2, 3, 2, 3, 2, 3, 2).

Hopkins, L. Thomas. Learning Essentials in an Activity Curriculum. J. Exp. Ed. 1: 298-303; June 1933.

Children taught in an experience curriculum achieved scores comparable to the norms established for those taught in a traditional curriculum.

s; ---; 1-only; 2434 students; 1.3, 1.4, 1.5; grs. 2-8; ---; norm;

---.

Hunziker, Charles W. and Douglass, Harl R. The Relative Effectiveness of a Large Unit Plan of Supervised Study and the Daily Recitation Method in the Teaching of Algebra and Geometry. Math. Teach. 30: 122-124; Mar. 1937. (a-5e, c-22, c-23)

The daily recitation procedure was found to result in greater gains than the supervised study procedure.

(I) supervised study or daily recitation procedures. (D) achievement.

a; ---; 2-s, 3-s; 68 students; 1.5, 3.15; grs. 9, 10; 1 yr.; norm,

non-norm; ---.

Johnston, A. Montgomery. A Survey of Teaching Practices--Arithmetic in Tennessee in the First Through Eighth Grades. Arith. Teach. 9: 425-432; Dec. 1962.

Four "long-held" hypotheses on variations in practice, variations from grade to grade, problems of practice, and teacher preparation were supported by this survey. Implications and applications of these findings are discussed.

s; ---; 2-s; 666 teachers; ---; teachers in grs. 1-8; ---; ---; ---.

Kersh, Bert Y. The Motivating Effect of Learning by Directed Discovery. J. Ed. Psychol. 53: 65-71; Apr. 1962. (c-3a, d-5)

The guided discovery procedure "motivated the student to practice more and thus to remember and transfer more than he might" if taught by a directed procedure. The rote learning group was, however, consistently superior.

(I) directed, guided discovery, or rote learning procedures.
(D) transfer; retention.

e; 2.16 r; 2-s, 3-r; 90 students; 2.6; gr. 10; 1 day (retention, 3 days, 2 wks., 6 wks.); non-norm; 16 (2, 1, 3, 2, 1, 3, 2, 1, 1).

Klinkerman, Ginger and Bridges, Faith. Team Teaching in Geometry. Math. Teach. 60: 488-492; May 1967. (a-6)

Students gave favorable reactions to a team-teaching plan; specific recommendations were cited.

(I) use of team teaching. (D) attitude.

a; ---; 1-only; 148 students; 1.1, 1.6; gr. 10; 1 semester; non-norm; ---.

Lackner, Lois M. The Teaching of Two Concepts in Beginning Calculus by Combinations of Inductive and Deductive Approaches. Final Report. June 1968. (ERIC Document No. ED 025 446) (c-25, d-5)

The deductive method resulted in better achievement on programmed calculus materials than the inductive method.

(I) concrete inductive or abstract deductive approach; achievement level. (D) achievement.

e; 3.4; 1-only; ---; 6.2, 6.4; grs. 11, 12; ---; ---; ---.

Teaching approaches (a-4)

Malinen, Paavo. *The Learning of Elementary Algebra; An Empirical Investigation of the Results of Learning in a Simplified School Learning System*. Jan. 1969. (ERIC Document No. ED 033 024) (c-22, f-2c)

Reasoning ability, numerical ability, attitude toward algebra, and "simple algebra" were found to be the most important variables when predicting success in algebra.

(I) type of course. (D) achievement; attitude.

a; ---; 1-only; 119 students; 3.2; grs. 7-9; ---; ---; ---.

Maynard, Fred J. and Strickland, James F., Jr. *A Comparison of Three Methods of Teaching Selected Mathematical Content in Eighth and Ninth Grade General Mathematics Courses. Final Report*. USOE Cooperative Research Project 8-0-035. Athens: University of Georgia, Aug. 1969. (ERIC Document No. ED 041 763) (c-21)

No significant differences were found for boys among the three methods, but girls had significantly better immediate achievement with the directed method.

(I) non-verbalized student discovery, student-teacher development, or directed (expository) method. (D) achievement; retention.

e; 3.8 r; ---; ---; ---; grs. 8, 9; ---; ---; ---.

Meconi, L. J. Concept Learning and Retention in Mathematics. *J. Exp. Ed.* 36: 51-57; Fall 1967. (a-5b, d-5, g-1, g-2, g-4, g-6a)

High ability students learned and retained effectively the necessary concepts for problem solving performance and retention regardless of instructional method (rule and example, guided discovery, or rule).

(I) three instructional methods. (D) achievement; retention.

e; 2.19 r; 2-s, 3-r; 45 students; 1.4, 3.2; grs. 8, 9; 2-3 days

(retention, 4 wks.); non-norm; 23 (1, 2, 3, 3, 3, 4, 3, 2, 2).

Michael, R. E. The Relative Effectiveness of Two Methods of Teaching Certain Topics in Ninth Grade Algebra. Math. Teach. 42: 83-87; Feb. 1949. (c-9, c-22, g-4)

Deductive procedures used in teaching a unit on integers produced significantly greater gains on a test of generalizations than did inductive procedures, while there were no significant differences on tests of computation and attitude. There was some evidence that those at higher IQ levels achieved more with the deductive procedure.

(I) inductive or deductive method; IQ. (D) computation; generalization; attitude.

e; 3.4; 2-s; 15 classes; 1.5, 3.3, 3.5; gr. 9; 45 days; non-norm;

23 (2, 3, 3, 3, 4, 2, 2, 2, 2).

Miller, G. H. How Effective Is the Meaning Method? Arith. Teach. 4: 45-49; Mar. 1957.

The meaning method was found to be more effective for computation of fractions, and for decimals and percentage; the rule method was superior for measurement. The meaning method seemed more effective for retention of computational processes, understanding of principles, and comprehension of complex analysis. The meaning method was found to be more effective with students of average and high IQ and the rule method was more effective with low IQ students, but this was confounded by bilingual factors.

(I) method taught: rule or meaning. (D) achievement; retention.

f; ---; 2-m, 3-s; 360 students for semester, 190 students for

retention; 1.2; gr. 7; 1 semester (retention, summer vacation);

norm, non-norm; ---.

Orleans, Joseph B. and Orleans, Jacob S. Teaching and Learning. Math. Teach. 26: 133-139; Mar. 1933. (c-22)

A series of printed lessons followed by tests in algebra and geometry was given to a group of students before they received any instruction in the subjects from the teacher. The tests were again administered after six weeks of instruction. The gains were low, showing that students learned far less from instruction than they were capable of learning by themselves.

Teaching approaches (a-4)

(I) effect of instruction. (D) achievement.

a; ---; ---; ---; ---; grs. 9, 10; 6 wks.; ---; ---.

Petersen, Orval L. Is the Traditional Ninth-Grade Mathematics Course Needed? Sch. Sci. Math. 63: 477-478; June 1963.

Students not taking mathematics courses retained mathematics skills about as well as those taking courses.

(I) systematic or incidental procedures. (D) achievement.

a; ---; 1-only; ---; 1.6, 1.8; gr. 9; ---; norm; ---.

Price, Jack. Discovery: Its Effects on Critical Thinking and Achievement in Mathematics. Math. Teach. 60: 874-876; Dec. 1967. (c-21, g-4)

Students taught by discovery procedures improved more than a deductively taught group in achievement, reasoning, and attitude. The group using transfer materials also showed a significant increase in critical-thinking ability.

(I) deductive, discovery, or discovery-transfer procedures.
(D) achievement.

e; 2.4; 2-r, 3-r; 3 classes; 1.5; gr. 10; ---; norm, non-norm;

24 (2, 3, 3, 3, 2, 2, 3, 3, 3).

Rappaport, David. The Meanings Approach in Teaching Arithmetic. Chicago Sch. J. 44: 172-174; Jan. 1963.

Mean scores increased with the maturity of the group tested; differences were statistically significant. According to the best information obtainable, none of those tested had been exposed to a meaningful arithmetic program, so it seemed that a definite growth in understanding of meanings in arithmetic could be attributed to increased maturity or incidental learning.

s; ---; 1-only; 800 students; 1.4; grs. 7-9, college; ---; non-norm;

---.

Ray, Willis E. Pupil Discovery vs. Direct Instruction. J. Exp. Ed. 29: 271-280; Mar. 1961. (d-3, g-1, g-2)

Students taught by a discovery procedure retained and transferred more than those taught by an expository procedure. No significant interaction between ability and method was found.

(I) discovery or expository instruction; IQ. (D) achievement; retention.

e; 3.15 r; 2-r, 3-r; 117 students; 2.6, 3.2, 6.4; gr. 9; 1 day

(retention, 1 wk., 6 wks.); non-norm; 20 (2, 3, 3, 2, 2, 3, 2, 1, 2).

Ruddell, Arden K. The Results of a Modern Mathematics Program. Arith. Teach. 9: 330-335; Oct. 1962. (f-2)

1) Children in accelerated classes taught a program of modern mathematics scored as high or higher than similar children taught a program of traditional mathematics.
2) Those of higher intelligence and high achievers scored significantly higher.
3) No significant interaction effects were found.

(I) modern or traditional program; IQ; achievement levels.
(D) achievement.

e; 2-s, 3-r; 4 classes; 3.2, 3.3, 3.4; gr. 7; 1 yr.; norm, non-norm;

19 (1, 3, 2, 5, 2, 1, 2, 2, 1).

Scandura, Joseph M.; Barksdale, Joan; Durnin, John H.; and McGee, Robert. An Unexpected Relationship Between Failure and Subsequent Mathematics Learning. Psychol. in Sch. 6: 379-381; Oct. 1969.

It was concluded that failure on a discovery task (involving number series) may have an inhibiting effect on subsequent learning.

(I) three rule and discovery problems. (D) achievement.

e; 2.8; 2-s, 3-r; 130 students; 1.6, 2.6; grs. 9, 11, 12; 3 days;

---; 18 (2, 2, 3, 1, 2, 2, 2, 2, 2).

Teaching approaches (a-4)

Schultz, Margaret and Ohlsen, M. M. A Comparison of Traditional Teaching and Personalized Teaching in Ninth Grade Algebra. Math. Teach. 42: 91-96; Feb. 1949. (c-22)

Students taught with individual diagnosis and help achieved higher scores than those taught by expository procedures.

(I) traditional or individualized instruction. (D) achievement.

e; 3.1; 2-s, 3-m; 4 classes; 1.4, 1.5; gr. 9; 117 days, 1 semester;

norm; 24 (2, 2, 2, 3, 3, 2, 4, 3, 3).

Sobel, Max A. Concept Learning in Algebra. Math. Teach. 49: 425-430; Oct. 1956. (c-22)

Students with high IQ achieved and retained significantly more when taught with inductive rather than deductive procedures; no differences were found for the average IQ group.

(I) inductive or deductive procedures. (D) achievement; retention.

e; 3.4 r; 2-s, 3-s; 14 classes; 1.4, 1.5; gr. 9; 4 wks. (retention,

3 mos.); non-norm; 28 (2, 3, 4, 4, 4, 3, 3, 2, 3).

Stallard, Burton J. and Douglass, Harl R. An Experimental Study of Two Plans of Supervised Study in First Year Algebra. J. Exp. Ed. 4: 17-19; Sept. 1935. (c-22, e-4)

The unit plan was found to be superior to a recitation plan for superior students, but no significant difference was found for average students.

(I) large unit assignments or recitation plus supervised study; ability. (D) achievement.

e; 3.4; 2-m, 3-s; 4 classes (96 students); 1.4, 3.15; gr. 9;

1 semester; norm; 18 (2, 2, 2, 2, 2, 3, 3, 1, 1).

Sutton, Joseph T. Individualizing Junior High School Mathematics Instruction. Final Report. Aug. 1967. (ERIC Document No. ED 016 609)

Some conventional classes achieved significantly higher gains than did individualized classes.

(I) individualized or conventional instruction. (D) achievement.

a; ---; 1-only; ---; ---; gr. 7; ---; norm; ---.

Werdelin, Ingvar. The Value of External Direction and Individual Discovery in Learning Situations: 1. The Learning of a Mathematical Principle. 1968. (ERIC Document No. ED 029 541)

Students taught by instruction on a principle before application to examples tended to learn the mathematical principle best, but those taught by example only were superior on tests of retention and transfer.

(I) inductive or deductive methods. (D) achievement; retention; transfer.

e; 3.8 r; ---; ---; ---; grs. 6, 8; ---; ---; ---.

Willits, William M. New Objectives for Ninth Grade Mathematics: An Exposition and Appraisal. J. Exp. Ed. 13: 31-45; Sept. 1944. (a-5i, c-22)

The class taught with a problem-solving orientation achieved better than a class taught by regular procedures and materials on the problem-solving subtest, but not on the mechanics subtest nor on a test of "straight thinking".

(I) problem-oriented or regular course. (D) achievement; thinking pattern.

e; 3.4; 2-s, 3-s; 2 classes (76 students); 1.3, 1.4, 1.8, 3.4, 3.15;

gr. 9; 1 yr.; norm; 33 (3, 4, 4, 4, 4, 4, 3, 4, 3).

Teaching approaches (a-4)

Wright, R. E. Something Old, Something New. Sch. Sci. Math. 70: 707-712; Nov. 1970. (ERIC Document No. EJ 030 085) (e-4)

There were no significant differences in gains between those using a traditional and two modern programs in learning traditional concepts, but those in the modern programs achieved higher scores on a test of modern concepts.

(I) modern or traditional programs; ability. (D) achievement.

e; 3.12; 2-s, 3-s; 225 students; 3.2, 3.3; gr. 8; 18 wks.; norm;

26 (2, 3, 3, 3, 3, 3, 3, 3, 3).

Wrightstone, J. Wayne. Comparison of Varied Curricular Practices in Mathematics. Sch. Sci. Math. 35: 377-381; Apr. 1935.

Students in schools using interest-oriented materials achieved higher scores than students using standard materials, but differences were significant only in geometry; use of standard-type materials resulted in significantly higher scores in intermediate algebra.

(I) mathematical- or interest-oriented materials. (D) achievement.

f; ---; 2-s, 3-m; 712 students; 1.4, 3.15; grs. 7-11; ---; norm;

---.

Teaching approaches (a-4)

Other References

Ayers, G. H., Dec. 1934	(f-2c)
Bierden, 1970	(e-4)
Bittinger, 1968	(r-2)
Bowman, Apr. 1932	(a-5b)
Dodes, 1953	(r-2)
Douglass, Dec. 1936	(r-2)
Feldhake, 1966	(a-6)
Gorman, 1943	(d-3)
Higgins, 1969	(a-6)
Higgins, 1970	(a-6)
Hountras & Belcastro, 1963	(d-5)
Jackson, W. N., 1955	(g-4)
Kenney, R. A. & Stockton, J. D., 1958	(c-6)
Kieren, 1969	(r-2)
Linn, M., 1934	(e-4)
Lucas, 1967	(d-5)
Meadowcroft, Dec. 1965	(d-5)
Meconi, Dec. 1967	(r-2)
Paulson, 1964	(g-6b)
Rappaport, 1958	(b-4)
Retzer, 1969	(c-13)
Retzer & Henderson, 1967	(c-13)
Rising & Ryan, July 1966	(g-5)
Schaaf, 1949	(r-2)
Skager, 1969	(a-5i)
Tanner, 1969	(r-2)
Thompson, W. H., 1933	(a-3)
Tredway & Hollister, 1963	(c-6)
Williams, E. D. & Shuff, R. V., 1963	(d-9)
Zahn, 1966	(b-6)

Drill and practice (a-5a)

Addleston, Lorraine W. Remotivating Arithmetic Fundamentals in the Junior High School. High Points 25: 65-70; Mar. 1943. (e-2)

Use of drill materials resulted in improved scores on a survey test.

(I) use of drill materials. (D) achievement.

a; ---; 1-only; ---; 1.1, 1.3, 1.6; grs. 7-9; 1 term; norm; ---.

Other References

Bailey, 1935	(d-8)
Buckingham, 1936	(e-1a)
Crawford, A. N., 1970	(d-6a)
Grossnickle, 1932	(c-3d)
Henry, 1935	(e-1a)
Jackson, N. A., 1931	(g-4)
Woody, Apr. 1930a	(a-5b)
Zahn, 1966	(b-6)

Alexander, Vincent E. Seventh Graders' Ability to Solve Problems. Sch. Sci. Math. 60: 603-606; Nov. 1960.

Some characteristic differences between high and low achievers in problem solving were analyzed. Conclusions related to mental ability, socioeconomic status, quantitative skills, reading skills, and interpretation of quantitative materials were noted, with implications for planning instruction.

r; ---; 2-s, 3-m; ---; ---; gr. 7; ---; norm; ---.

Berglund-Gray, Gunborg. Difficulty of the Arithmetic Processes. El. Sch. J. 40: 198-203; Nov. 1939. (c-3)

1) The position as first or second process in a problem definitely affected the difficulty of an arithmetical process. The ascending order of difficulty of the processes when used as the first step in the solution was: addition, multiplication, subtraction, division. The order of difficulty of the processes when used as the second step was: subtraction, addition, division, multiplication.
2) The difficulty level also depended on which other process appears in the problem.
3) Essentially the same results were obtained in all grades tested and at all levels of ability.

s; ---; 1-only; 3831 students; 1.1, 1.6; grs. 5-7; ---; non-norm;

---.

Berglund-Gray, Gunborg and Young, Robert V. The Effect of Process Sequence on the Interpretation of Two-Step Problems in Arithmetic. J. Ed. Res. 34: 21-29; Sept. 1940. (c-3)

The difficulty of interpreting arithmetic problems was found to be definitely affected by the order of occurrence of the fundamental solution processes. More difficult than their reverses were: subtraction-addition, addition-multiplication, division-addition, division-subtraction, subtraction-multiplication, division-multiplication.

(I) order of processes in problems. (D) achievement.

e; 3.22; 2-s, 3-m; 4444 students; 1.1, 1.6; grs. 5-7; 1 testing;

non-norm; 26 (4, 1, 3, 3, [illegible], 3, 4, 2, 2).

Problem solving (a-5b)

Bowman, Herbert Lloyd. The Relation of Reported Preference to Performance in Problem Solving. J. Ed. Psychol. 23: 266-276; Apr. 1932. (a-4)

1) Purely computational problems were preferred over those in a descriptive setting; performance was also better.
2) Of problems involving description, those based on children's activities were most preferred and most successfully performed; adult-types were second; puzzle-type, third; and science-type, lowest.

r; ---; 1-only; 564 students; 1.6, 6.4; grs. 7-9; 1 testing; non-norm; ---.

Bowman, Herbert Lloyd. Reported Preference and Performance in Problem Solving According to Intelligence Groups. J. Ed. Res. 25: 295-299; Apr./May 1932.

1) Students of lower intelligence preferred problems involving few or no complex situations or descriptive analysis.
2) Students of higher intelligence tended to report no distinct preference as to type and performed more equally well on all types.
3) Problems dealing with child life activities were consistently well-liked, as was computation only.

(I) type of problem; IQ. (D) preference.

f; ---; 1-only; 413 students; 1.6; jr. high; ---; norm; ---.

Hanna, Paul R. Methods of Arithmetic Problem Solving. Math. Teach. 23: 442-450; Nov. 1930.

1) Fourth grade children using the diagrammatical method achieved higher scores than children using other methods. The individual method was slightly superior to the conventional formula method.
2) Seventh grade students made significant gains using individual and diagrammatical methods.
3) For superior students, results favored the diagrammatical and individual methods, while for average and inferior groups, those using the individual method consistently made the greatest gains.

(I) three methods of solving problems; arithmetic ability.
(D) achievement.

e; 3.1; 2-s, 3-m; 477 students (24 classes); 1.4, 3.15; grs. 4, 7;

---; norm; 12 (2, 2, 1, 2, 1, 1, 1, 1, 1).

Hawkins, George E. Teaching Verbal Problems in First Year Algebra. Sch. Sci. Math. 32: 655-660; June 1932. (c-22)

The group given practice in notation and problem analysis achieved higher scores than the group not given such practice.

(I) practice in notation and in problem analysis. (D) achievement.

a; ---; 1-only; 2 classes; 1.3; gr. 9; ---; norm, non-norm; ---.

Hudgins, Bryce B. and Smith, Louis M. Group Structure and Productivity in Problem-Solving. J. Ed. Psychol. 57: 287-296; Oct. 1966. (e-4)

Group solutions to problems were not better than the independent solutions by the most able member of the group if he was perceived to be most able; when he was not so perceived in arithmetic, the group did better. A shift in the group's perception of a low-status high-ability member occurred if the group's scores were not better than the individual's.

(I) ability levels; arithmetic or social studies problems; status of student (pre-task); SES. (D) number of problems solved by individual, group; status of student (post-task).

e; 2.18; 2-s, 3-m; 144 students; 1.4, 3.4; grs. 5-8; 1 hr.; norm;

22 (2, 1, 3, 2, 2, 3, 4, 2, 3).

Problem solving (a-5b)

Johnson, J. T. On the Nature of Problem-Solving in Arithmetic. J. Ed. Res. 43: 110-115; Oct. 1949. (d-7)

1) Correlations between arithmetic and intelligence tests were presented, and questions raised about the high correlation of the vocabulary section of an intelligence test with some but not all sections of arithmetic tests.
2) Problems without numbers were more difficult than those with numbers, yet correlated less well with the vocabulary test.
3) Correlations between number sections of an intelligence test and arithmetic tests were lower than between vocabulary and arithmetic.

r; ---; 1-only; 6 schools; 1.1, 1.6, 6.4; gr. 8; ---; norm, non-norm; ---.

Kellar, Wylma Rose. The Relative Contribution of Certain Factors to Individual Differences in Algebraic Problem Solving Ability. J. Exp. Ed. 8: 26-35; Sept. 1939. (c-22)

Variance in algebra problem solving ability was found to be attributable to variation in computation (39%), arithmetic problems (14%), IQ (7%), and other factors (40%).

r; ---; 1-only; 284 students; 1.4, 1.6, 6.3, 6.4; gr. 9; ---; norm, non-norm; ---.

Kennedy, George; Eliot, John; and Krulee, Gilbert. Error Patterns in Problem Solving Formulations. Psychol. in Sch. 7: 93-99; Jan. 1970. (ERIC Document No. EJ 014 939) (g-4)

Numerical problems offered little difficulty, but algebraic word problems were more difficult for less able students. Both able and less able students recognized the relationships needed for equations, but less able students did not identify logical or physical inferences as well and were likely to process information sequentially.

(I) type of problem; previous achievement level. (D) pattern of solving problems.

e; 3.19; 2-s, 3-s; 28 students; 1.1; gr. 11; ---; non-norm; 21 (2, 2, 2, 2, 2, 2, 4, 2, 3).

Lueck, William R. An Experiment in Writing Algebraic Equations. J. Ed. Res. 42: 132-137; Oct. 1948. (c-22)

Students taught to find fundamental facts in algebra problems scored higher than those having only the usual instruction.

(I) analysis of problems. (D) achievement.

e; 3.1; 2-s, 3-m; 50 students; 1.4, 1.5, 1.6, 3.15; gr. 9; 1 yr.;

non-norm; 29 (3, 3, 4, 4, 3, 2, 4, 3, 3).

Lyda, W. J. Direct, Practical Experiences in Mathematics and Success in Solving Realistic Verbal "Reasoning" Problems in Arithmetic. Math. Teach. 40: 166-167; Apr. 1947.

The conclusions of a survey of students of three intelligence levels were briefly cited. Direct experiences related to "reasoning" problems led to success in solving such problems, especially as intelligence level decreased.

s; ---; 1-only; ---; 1.6; gr. 7; ---; ---; ---.

Lyda, Wesley John and Franzen, Carl G. F. A Study of Grade Placement of Socially Significant Arithmetic Problems in the High-School Curriculum. J. Ed. Res. 39: 292-295; Dec. 1945. (a-2)

The importance of using problems related to direct experiences decreases as IQ and years in school increase.

s; ---; 1-only; 430 students; ---; grs. 7-11; ---; non-norm; ---.

Mitchell, Claude. Problem Analysis and Problem-Solving in Arithmetic. El. Sch. J. 32: 464-466; Feb. 1932.

Five of the most difficult problems from the Public School Achievement Tests were presented a second time with analytical questions. Sixty per cent of the students made gains in scores, three per cent made losses, 37 per cent showed no change.

s; ---; 1-only; 117 students; 1.1; grs. 7, 8; ---; norm, non-norm;

---.

Problem solving (a-5b)

Pyle, W. H. An Experimental Study of the Development of Certain Aspects of Reasoning. J. Ed. Psychol. 26: 539-546; Oct. 1935.

Ten problems, the grades at which each was first answered correctly, and the percentages answering each at each grade level were presented.

e; ---; 1-only; 9000 students; 1.1, 1.6; grs. 3-12; ---; non-norm;

---.

Robertson, M. S. Problem Solving in Arithmetic. Peabody J. Ed. 9: 176-183; Nov. 1931. (a-5d)

1) Mean scores were higher at all grade levels when tests were read by students than when read by teachers.
2) Differences in improvement between grade levels were discussed.
3) Correlations between the two types of tests and a standardized test ranged from .44 to .56, while correlations between the teacher- and student-read tests ranged from .51 to .68.

(I) problems read by teacher or student. (D) achievement.

e; 3.19; 1-only; 712 students; 1.1, 1.4, 1.5, 1.6, 3.17, 6.4; grs.

4-7; 1 day; norm, non-norm; 29 (3, 3, 4, 4, 5, 2, 3, 2, 3).

Sherrill, James M. The Effects of Differing Presentations of Mathematical Word Problems Upon the Achievement of Tenth Grade Students. July 1, 1970. (ERIC Document No. ED 040 859)

Students achieved significantly higher when given word problems with accurate pictures than when given no picture. Distorted pictures were least effective.

(I) type of problem. (D) achievement.

e; 3.8; 1-only; ---; ---; gr. 10; ---; ---; ---.

Stevens, B. A. Problem Solving in Arithmetic. J. Ed. Res. 25: 253-260; Apr./May 1932.

1) Examination of correlations existing among tests of general reading ability, arithmetic reading ability, intelligence, arithmetic problem solving ability, and ability in the fundamental operations, seemed to show that ability in fundamental operations was more closely correlated with ability in problem solving than was general reading ability.
2) Tests of problem analysis seemed to have higher correlations with tests of problem solving than did tests of general reading or of fundamental operations.

r; ---; 2-s; 3089 students; 6.3, 6.4; grs. 3-7; ---; norm; ---.

Stright, I. L. Relation of Reading Comprehension and Efficient Methods of Study to Skill in Solving Mathematical Problems. Math. Teach. 31: 368-372; Dec. 1938. (c-22, d-7)

Special training on reading resulted in higher algebra test scores.

(I) practice on reading. (D) achievement.

e; 3.4; 2-s, 3-s; 70 students; 1.4, 1.6, 3.15; gr. 9; ---; norm;

32 (3, 3, 4, 5, 3, 4, 4, 3, 3).

Travers, Kenneth J. A Test of Pupil Preference for Problem-Solving Situations in Junior High School Mathematics. J. Exp. Ed. 35: 9-18; Summer 1967. (a-6)

The order of preference for the three types of problem-solving situations was: social-economic, mechanical-scientific, abstract. High achievers had fewer preferences, and favored the abstract problems more than did low achievers. No difference in success between "preferred" and "non-preferred" situations was found.

(I) type of problem. (D) preference; achievement.

f; ---; 2-s; 120 boys; 1.1, 1.9, 3.2, 4.4; gr. 9; ---; ---; ---.

Problem solving (a-5b)

Treacy, John P. The Relationship of Reading Skills to the Ability to Solve Arithmetic Problems. J. Ed. Res. 38: 86-96; Oct. 1944. (d-7)

1) Good achievers in problem solving were significantly superior to poor achievers in all of the fifteen reading skills studied and in mental age.
2) When mental age and chronological age were controlled, good achievers were found to be significantly better than poor achievers on more skills, while no significant differences were found on the other six skills.
3) It was concluded that reading in problem solving must be considered a composite of specific skills rather than a generalized ability, and teaching must be planned for these specific skills.

(I) reading skills. (D) problem-solving ability.

f; ---; 1-only; 244 students; 1.12, 3.4, 6.7; gr. 7; ---; norm; ---.

Woody, Clifford. Some Investigations Resulting from the Testing Program in Arithmetic: An Investigation to Determine the Influence of Specialized Drill in Reading Upon the Solution of Verbal Problems. Ind. U. Sch. Ed. B. 6: 30-39; Apr. 1930(a). (1st of 3 studies.) (a-5a)

Classes using practice booklets for solving verbal arithmetic problems made greater gains in problem solving and analysis than classes not using the booklets.

(I) practice in reading verbal problems; sex; age; MA. (D) scores in problems, fundamentals, vocabulary, and reading.

e; 2.1; 2-m, 3-i, 195 students (6 school systems); 1.1, 1.4, 1.5;

grs. 5-7; 10 wks.; norm; 28 (2, 3, 3, 3, 3, 4, 5, 3, 2).

Other References

Alexander, V. E., 1962	(e-6)
Bowman, June 1932	(f-1a)
Brown, G. W., 1964	(f-1b)
Call & Wiggin, 1966	(d-7)
Clem & Hendershot, 1930	(e-1a)
Connor & Hawkins, 1936	(f-1a)
Dresher, 1934	(d-7)
Janes, 1937	(d-1)
Johnson, H. C., 1944	(d-7)
Kilpatrick, Oct. 1969	(r-2)
Kilpatrick, 1969	(r-2)
Meconi, Fall 1967	(a-4)
Rimoldi, Aghi, & Burder, 1968	(g-7d)
Russell, D. H. & Holmes, F. M., 1941	(d-7)
Semmelmeyer, 1949	(d-7)

Estimation (a-5c)

Mazzei, Renato. A Technique for the Prevention of Errors in Arithmetic. Sch. Sci. Math. 59: 493-497; June 1959.

Classes encouraged to estimate answers increased scores only slightly over the scores of classes where estimation was not mentioned.

(I) use of estimation. (D) achievement.

e; 3.1; 2-s, 3-m; 4 classes (92 students); 1.4, 1.6, 3.15; grs. 9,

10; 8 wks.; norm; 35 (3, 3, 5, 5, 4, 4, 4, 3, 4).

Austin, John C. Mental Mathematics Counts. Arith. Teach. 17: 337-338; Apr. 1970. (ERIC Document No. EJ 018 789)

When students spent one period a week on mental computation, standardized test scores were found to be significantly higher than those of students not given systematic instruction in mental computation.

(I) instruction in mental computation. (D) achievement.

f; ---; 2-r; 400 students; 3.2, 3.3; grs. 7, 8; ---; norm; ---.

Olander, Herbert T. and Brown, Betty Irene. A Research in Mental Arithmetic Involving Subtraction. J. Ed. Res. 53: 97-102; Nov. 1959. (c-3b)

1) The visual-mental order of test presentation resulted in higher scores than the oral-mental order, but the visual-paper-and-pencil order seemed best. (Practice effects are not considered by the investigator; their effects seem highly possible, however.)
2) Interviews with the highest and lowest achievers led to these conclusions:
    a) More than 90 per cent at both levels used "take-away" method and decomposition procedure.
    b) Some methods used could be associated more with mental than paper-and-pencil computation.
    c) High achievers tended to use a greater variety of thought processes.

(I) three forms of test. (D) achievement; mode of thinking.

e; 3.19; 1-only; 1400 students; 1.6, 6.4; grs. 6-12; 1 sitting;

norm, non-norm; 36 (2, 2, 5, 5, 5, 5, 4, 4, 4).

Other Reference

Robertson, 1931 (a-5b)

Homework and supervised study (a-5e)

Brown, Robert M. A Comparison of Two Approaches of Evaluating Students' Homework Assignments in Elementary Algebra. Grad. Res. in Ed. & Related Disciplines 2: 97-98; Apr. 1966. (c-22)

No significant differences in test scores or homework grades were found between groups who received only grades or only conferences on homework. The conference group scored higher on tests and the graded group, on homework.

(I) grades on homework or conferences about homework. (D) achievement; attitude.

e; ---; ---; 50 students (2 classes); ---; gr. 9; 4 wks.; non-norm;

---.

Crawford, C. C. and Carmichael, Jacob A. The Value of Home Study. El. Sch. J. 38: 194-200; Nov. 1937.

No significant difference in scores was found during three years with home study and three years after home study was abolished. Arithmetic reasoning scores decreased, while computation scores increased.

(I) homework or no homework. (D) achievement.

a; ---; 1-only; ---; 1.4, 1.5; grs. 5-8; 6 yrs.; norm; ---.

Foran, T. G. and Weber, Sister Magdalen Marie. An Experimental Study of the Relation of Homework to Achievement in Arithmetic. Math. Teach. 32: 212-214; May 1939.

1) Groups receiving homework made slightly higher gains on problem-solving tests than when they received no homework.
2) Scores on computation tests showed an advantage for homework in one group and for no homework in the other group; when averaged, the groups receiving homework scored higher.

(I) homework or no homework. (D) achievement.

e; 3.18; 1-only; 292 students (7 classes); 1.4, 1.5; gr. 7; 1 yr.;

norm; 35 (2, 3, 4, 5, 5, 3, 5, 4, 4).

Griff, Ernest R. The Comparative Effectiveness of One-Level and Three-Level Assignments in Plane Geometry. Math. Teach. 50: 214-216; Mar. 1957. (c-23)

Students tended to work more effectively under the one-level assignment plan than under the three-level plan, although correlations with final grades were higher when the three-level plan was used.

(I) type of assignment. (D) achievement.

a; ---; 1-only; 3 classes (79 students); 1.4, 6.4; gr. 10; 1 yr.;

norm; ---.

Hines, Vynce A. Homework and Achievement in Plane Geometry. Math. Teach. 50: 27-29; Jan. 1957. (c-23)

Out-of-class study resulted in increased achievement, and differences from a group not doing homework increased during the year.

(I) home study. (D) achievement.

a; ---; 2-m; 32 students; 1.4, 3.4, 3.15; gr. 10; 1 yr.; norm,

non-norm; ---.

Jackson, Nelson A. Home Work Papers in First Year Algebra. Math. Teach. 23: 23-24; Jan. 1930. (c-22)

The correlation of the number wrong on homework and quiz exercises was found to be .32; marks on each correlated .49.

r; ---; 1-only; 1 class; 1.1, 6.4; gr. 9; 3 wks.; non-norm; ---.

Orleans, Joseph B. Testing the Ability to Study. Math. Teach. 29: 170-177; Apr. 1936. (c-22)

Tests and results for students who studied mathematical material on their own were presented.

(I) independent work. (D) achievement.

a; ---; 1-only; 468 students; 1.1; grs. 9, 10; ---; ---; ---.

Homework and supervised study (a-5e)

Small, Dwain E.; Holtan, Boyd D.; and Davis, Edward J. A Study of Two Methods of Checking Homework in a High School Geometry Class. Math. Teach. 60: 149-152; Feb. 1967. (c-23, d-9)

Students whose homework was checked and graded differed little in achievement from those whose homework was only spot-checked.

(I) homework checked by two procedures. (D) achievement.

a; ---; 2-s, 3-m; 2 classes; 1.4, 3.4; gr. 10; 1 yr.; norm, non-

norm; ---.

Stallard, Burton J. and Douglass, Harl R. An Experimental Study of Two Plans of Supervised Study in First Year Algebra. Sch. Sci. Math. 36: 78-81; Jan. 1936. (c-22, d-2)

The long-unit plan of supervised study was found to be better than the daily assignment plan for superior students, but no difference was found for average students.

(I) long-unit assignment or daily assignment; ability. (D) achievement.

e; 3.1 r; 2-s, 3-m; 4 classes; ---; gr. 9; 1 semester (retention

after semester 2); norm; 29 (3, 2, 3, 4, 3, 4, 4, 3, 3).

Steiner, M. A. Value of Home-Study Assignments. Sch. & Soc. 40: 20-24; July 7, 1934.

Home-study assignments in arithmetic appeared to affect achievement more than those in English.

(I) homework in arithmetic or English. (D) achievement.

e; 3.4; 2-m, 3-s; 34 students; 1.1, 1.4, 1.5, 1.7; gr. 7; 18 wks.;

norm; 43 (4, 5, 5, 5, 5, 4, 5, 5, 5).

Homework and supervised study (a-5e)

Teahan, E. Gladys. Required Home Study is Unwise. *Sch. Bd. J.* 91: 41; Nov. 1935.

Of the required-home-study group, 89.9 per cent showed a median improvement of 11.10 per cent, while of the no-home-study group, 92.3 per cent showed a median improvement of 11.18 per cent. It was concluded that required homework was not of advantage to students.

(I) homework or no homework. (D) achievement.

e; 3.4; 2-s, 3-m; 12 groups; 1.3, 1.6; grs. 6-8; 115 days; norm;

41 (3, 4, 5, 5, 5, 5, 5, 4, 5).

Other References

Goldstein, 1960	(r-2)
Hunziker & Douglass, 1937	(a-4)

Review (a-5f)

[No research reports were assigned to this category.]

Checking (a-5g)

[No research reports were assigned to this category.]

Writing and reading numerals (a-5h)

Newland, T. Ernest. A Study of the Specific Illegibilities Found in the Writing of Arabic Numerals. J. Ed. Res. 21: 177-185; Mar. 1930.

1) Elementary students wrote two of every one hundred numerals illegibly and junior high students somewhat less than two; adults wrote four of every 100 numerals illegibly.
2) On the whole, 5 was most frequently illegible, then 7, 2, 0, 4, 9, 8, 6, 3, 1. For third and fourth graders, the order of illegibility was 6, 5, 7, 8, 4, 2, 0, 9, 3, 1.
3) One hundred forty-six different forms of illegibility were noted.

s; ---; 1-only; 1127 students; 1.1, 1.3; grs. 3, 4, 7, 9, adult;

---; ---; ---.

Rebert, G. Nevin. A Laboratory Study of the Reading of Familiar Numerals. J. Ed. Psychol. 23: 35-45; Jan. 1932. (d-8)

Eye-movement records were analyzed to determine how numerals are read when they appear in context.

s; ---; 1-only; 106 students; ---; sec., college; ---; ---; ---.

Specification of objectives (a-5i)

Skager, Rodney W. Student Entry Skills and the Evaluation of Instructional Programs: A Case Study. Feb. 1969. (ERIC Document No. ED 029 364) (a-4, e-2a, t-2d)

Teachers were found to select instructional objectives that reflected skills already available to their students, and to gear instruction to skills already achieved by students at entry into the program.

(I) program for low achievers or regular program. (D) achievement.

e; 3.4; 2-s, 3-s; 488 students; ---; gr. 7; ---; non-norm; ---.

Other References

Bierden, 1970	(e-4)
Brown, K. E., 1950	(t-2c)
Campbell, 1964	(a-4)
Werner, 1970	(b-3)
Willits, 1944	(a-4)

Attitude, self-concept, and climate (a-6)

Amatora, Sister Mary. School Interests of Early Adolescents. J. Genet. Psychol. 98: 133-145; Mar. 1961. (e-6)

Eighth grade boys were more interested in arithmetic than were seventh grade boys, but girls rated it higher in grade 7 than in grade 8.

s; ---; 2-s; 679 students; 1.6; grs. 7, 8; ---; ---; ---.

Anderson, George R. These Eighth Graders Don't Hate Arithmetic. Math. Teach. 51: 267-269; Apr. 1958.

Students in an experimental group for a larger study ranked mathematics first, while those in a control group ranked it second among four subjects.

s; ---; 1-only; 534 students; 1.4; gr. 8; ---; ---; ---.

Anttonen, Ralph G. A Longitudinal Study in Mathematics Attitude. J. Ed. Res. 62: 467-471; July/Aug. 1969. (ERIC Document No. EJ 007 271)

A significant positive correlation was found between attitude scores of students tested in elementary school and again in secondary school. Significant positive correlations were also reported between all measures of attitude and achievement.

r; ---; 1-only; 607 students; ---; grs. 5, 6, 11, 12; ---; ---; ---.

Bachman, Alfred Morry. The Relationship Between a Seventh-Grade Pupil's Academic Self-Concept and Achievement in Mathematics. J. Res. Math. Ed. 1: 173-179; May 1970. (f-3)

General self-concept and self-concept in mathematics were each found to be significantly related to mathematics achievement, with mathematics self-concept related significantly more to such achievement than was general self-concept.

r; ---; 2-s; 408 students; 6.4; gr. 7; ---; norm, non-norm; ---.

Billig, A. L. Student Attitude as a Factor in the Mastery of Commercial Arithmetic. Math. Teach. 37: 170-172; Apr. 1944. (c-26, f-1a, f-2c)

A scale was developed which was used to ascertain those with negative or indifferent attitudes who would be likely to fail the course.

s; ---; 2-s; 108 girls; 1.6; gr. 10; ---; non-norm; ---.

Butler, Charles H. How Much Do Pupils Enjoy Mathematics? Math. Teach. 23: 307-310; May 1930. (e-6)

Two-thirds of the students indicated they had recently done mathematical work just because they liked to.

s; ---; 1-only; 73 students; 1.1, 1.6; grs. 7-12; ---; ---; ---.

Cutts, N. E. and Moseley, Nicholas. Bright Children and the Curriculum. Ed. Adm. & Sup. 39: 168-173; Mar. 1953.

Mathematics was ranked first by bright children as the "subject liked best" (by 152), the "subject liked least" (by 185) and the "subject making pupil work hardest" (by 236).

s; ---; 1-only; 673 students; ---; grs. 2-12; ---; ---; ---.

Doak, E. Dale. An Evaluation Approach Designed to Identify the Levels of Thinking Existent in Select Classrooms as Exhibited by Teacher and Student Verbal Behavior. Final Report. Mar. 1966. (ERIC Document No. ED 015 817)

No differences in amount or type of interaction were found between classes in tracks 1 or 4.

(I) type of track. (D) interaction record.

f; ---; 1-only; ---; ---; gr. 8; ---; ---; ---.

Attitude, self-concept, and climate (a-6)

Dutton, Wilbur H. Attitudes of Junior High School Pupils Toward Arithmetic. Sch. R. 64: 18-22; Jan. 1956.

1) Extreme dislike for arithmetic was shown by the responses of a significant number of students (19%).
2) Most students (87%) enjoyed problems when they knew how to work them well. They also felt that arithmetic was as important as any other subject (83%).
3) Girls showed a little more dislike for arithmetic than boys.
4) Reasons given for liking arithmetic included practical aspects of the subject, the realization that it will be needed, and enjoyment and challenge.
5) Students' dislike for arithmetic centered on lack of understanding, difficulty in working problems, poor achievement, and boring aspects.
6) Apparently lasting attitudes were developed at each grade level; grade 5 and 7 seemed most crucial.

s; ---; 2-s; 459 students; 1.1, 1.6; grs. 7-9; ---; non-norm; ---.

Dutton, Wilbur H. Another Look at Attitudes of Junior High School Pupils Toward Arithmetic. El. Sch. J. 68: 265-268; Feb. 1968. (a-1)

A comparison of 1956 and 1966 junior high student attitudes toward arithmetic found a slightly favorable change; the recent group had "new" mathematics.

s; ---; 1-only; 759 students; 1.1, 1.6; jr. high; ---; non-norm; ---.

Dutton, Wilbur H. and Blum, Martha Perkins. The Measurement of Attitudes Toward Arithmetic with a Likert-Type Test. El. Sch. J. 68: 259-264; Feb. 1968. (f-1b)

The development of a revised form of the Dutton attitude scale was discussed. About 30 per cent of the students had very favorable attitudes toward the new mathematics, 53 per cent were neutral, and 17 per cent disliked the subject a great deal.

s; ---; 2-s; 346 students; 1.6; grs. 6-8; ---; non-norm; ---.

Feldhake, Herbert J. Student Acceptance of the New Mathematics Programs. Arith. Teach. 13: 14-19; Jan. 1966. (a-4)

The feelings of upper and average ability students towards new mathematics and chapters of a text were investigated. Need for improvement in presentation of some chapters and decreased difficulty for comprehension were indicated.

s; ---; 1-only; 427 students (13 classes); 2.6, 5.2, 6.5; gr. 7;

---; non-norm; ---.

Higgins, Jon L. The Mathematics Through Science Study: Attitude Changes in a Mathematics Laboratory. SMSG Reports, No. 8. Stanford, California: Stanford University, 1969. (ERIC Document No. ED 042 631) (a-4, d-3, d-8, d-9)

It was concluded that the formation of strong cohesive attitude groups is not a major factor for consideration in the design of mathematics units taught via physical materials.

(I) laboratory setting. (D) attitude.

e; 3.18; 1-only; 29 classes; 1.4, 3.3, 3.4; gr. 8; 5 wks.; norm;

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Higgins, Jon L. Attitude Changes in a Mathematics Laboratory Utilizing a Mathematics-Through-Science Approach. J. Res. Math. Ed. 1: 43-56; Jan. 1970. (a-4, d-3, d-8, d-9)

Significant differences were found on six attitude scales after instruction in a laboratory setting. When data were analyzed in terms of naturally occuring attitude groups, no significant relationship to achievement was found.

(I) laboratory setting. (D) attitude.

e; 3.18; 1-only; 29 classes; 1.4, 3.3, 3.4; gr. 8; 5 wks.; norm;

17 (2, 2, 2, 3, 3, 1, 1, 1, 2).

Attitude, self-concept, and climate (a-6)

Hill, John P. Similarity and Accordance Between Parents and Sons in Attitudes Toward Mathematics. Child Develop. 38: 777-791; Sept. 1967. (f-3)

Parental attitudes toward mathematics and expectations for sons' performance were not significantly correlated. Mother-son similarity was greater than father-son similarity, but father-son accordance on expectations was greater than mother-son accordance.

r; ---; 2-s; 35 boys; 2.6, 6.4; gr. 7; ---; non-norm; ---.

Klein, Adolph. Failure and Subjects Liked and Disliked. High Points 19: 22-25; Jan. 1937.

Mathematics was the most-liked subject by 14 per cent of those taking it (rank 19), rated least-liked by 34 per cent (rank 1) and failed most often (by 46 per cent).

s; ---; 1-only; 2245 students; 1.6; sec.; ---; ---; ---.

Mallinson, George Greisen and Van Dragt, Harold. Stability of High-School Students' Interests in Science and in Mathematics. Sch. R. 60: 362-367; Sept. 1952.

Data from a previous study were reanalyzed; between grades 9 and 12, interest scores of 111 students increased, 125 decreased, and 4 remained the same. Rank remained the same in only one-fourth of the cases.

s; ---; 2-s; 240 students; 1.1, 1.9, 6.4; grs. 9, 12; ---; ---; ---.

Malone, William H. and Freel, Eugene L. A Preliminary Study of the Group Attitudes of Junior and Senior High School Students Toward Mathematics. J. Ed. Res. 47: 599-608; Apr. 1954.

1) Students' attitudes were changed in relation to the practical value of mathematics and the learning environment.

2) Students' attitudes reflected a desire for more thorough presentation of the subject.

3) Attitudes seemed relatively enduring.

s; ---; 1-only; 803 students; 1.1, 1.4; grs. 7-12; ---; ---; ---.

Mosher, Howard H. Subject Preferences of Girls and Boys. Sch. R. 60: 34-38; Jan. 1952.

1) Arithmetic was the subject preferred in grades 4 through 8 in all types of schools, and was infrequently mentioned as one of the three most disliked subjects.
2) Little statistical significance was found for differences in preference by sex.

s; ---; 2-s; 2164 students; 1.9; grs. 4-12; ---; ---; ---.

Osborn, L. G. Relative Difficulty of High-School Subjects. Sch. R. 47: 95-100; Feb. 1939. (e-6)

Girls rated mathematics as more difficult than did boys.

s; ---; 1-only; 8785 students; 1.3, 3.15; sec.; ---; ---; ---.

Parkinson, Daniel S. School Influence in Student Choices of High-School Mathematics Courses. J. Ed. Res. 55: 101-106; Nov. 1961. (g-5)

Both school and non-school influences were found to affect student enrollment in mathematics courses.

s; ---; 1-only; 166 schools, 324 students; 1.6; sec.; ---; ---; ---.

Proctor, Virginia H. and Wright, E. Muriel J. Systematic Observation of Verbal Interaction as a Method of Comparing Mathematics Lessons. June 1961. (ERIC Document No. ED 003 827)

Distinctive patterns in content, process, and attitude were determined using an observational instrument with four types of classes.

(I) type of lesson. (D) interaction pattern.

s; ---; 1-only; 12 classes; ---; gr. 12, college; ---; ---; ---.

Resnick, Abraham C. A Study of the Likes and Dislikes of Pupils Studying Plane Geometry. High Points 16: 47-49; Sept. 1934. (c-23)

Only 15 per cent of the students definitely disliked geometry. Percentages who liked or disliked 19 topics were presented.

s; ---; 1-only; 565 students; 1.6; gr. 10; ---; ---; ---.

Roberts, Fannie M. Attitudes Toward Mathematics of Faculty and Students in Three High Schools. Sch. Sci. Math. 70: 785-793; Dec. 1970. (ERIC Document No. EJ 031 713)

While no significant differences between attitudes of teachers and students were found on total scores, teachers' mean scores were significantly higher on "attitudes toward mathematics as a process", and students' mean scores were significantly higher on "attitudes toward the place of mathematics in society".

s; ---; 1-only; 323 students, 112 teachers; 1.4, 3.4; grs. 8, 9,

12 (3 schools); ---; non-norm; ---.

Ryan, James J. Effects of Modern and Conventional Mathematics Curricula on Pupil Attitudes, Interests, and Perception of Proficiency. July 1967, Aug. 1967, Jan. 1968. (ERIC Document No. ED 015 873; ED 015 874; ED 022 673) (c-22, d-9)

Little difference was noted in attitude toward mathematics of students in three experimental or the conventional programs.

(I) experimental or conventional program. (D) attitude.

a; ---; 1-only; 252 students; ---; gr. 9; ---; ---; ---.

Stephens, Lois. Comparison of Attitudes and Achievement Among Junior High School Mathematics Classes. Arith. Teach. 7: 351-356; Nov. 1960. (c-10, e-4)

A significant difference in attitude was found between remedial and accelerated groups.

(I) three types of achievement groups; high or low achievement level. (D) attitude.

f; ---; 2-s; 348 students; 3.4; grs. 7, 8; 1 testing; non-norm; ---.

Yamamoto, Kaoru; Thomas, Elizabeth C.; and Karns, Edward A. School-Related Attitudes in Middle-School Age Students. Am. Ed. Res. J. 6: 191-206; Mar. 1969. (ERIC Document No. EJ 003 400)

On the "vigor" dimension of a semantic differential scale, mathematics was ranked higher than science, social studies, or language. On the "certainty" dimension, mathematics was ranked second. Differences by sex and grade were reported.

s; ---; 2-r; 1600 students; 1.4, 3.2, 3.3, 6.1; grs. 6-9; ---; ---; ---.

(Unsigned) What Pupils Think About Demonstrative Geometry. High Points 17: 31-37; Mar. 1935. (c-23)

Twenty-one per cent of the students ranked geometry the favorite of five subjects; 28 per cent ranked it second. Boys preferred geometry more than did girls. Specific reasons were cited.

s; ---; 1-only; 5 classes; 1.6, 1.9; gr. 10; ---; ---; ---.

Attitude, self-concept, and climate (a-6)

Other References

Aiken, 1969	(r-2)
Aiken, Mar. 1970	(r-2)
Aiken, Oct. 1970	(r-2)
Amidon & Flanders, 1961	(a-4)
Anderson, G. R., 1957	(d-3)
Bowman, June 1932	(f-1a)
Degnan, 1967	(e-5)
Devine, 1968	(d-5)
Dunlap, 1935	(f-1a)
Greenfeld & Finkelstein, 1970	(f-1b)
Harrison, F. I., June 1969	(e-7)
Holtan, 1964	(g-5)
Kennedy, W. A. & Willcutt, H., 1963	(e-5)
Klinkerman & Bridges, 1967	(a-4)
Longstaff, *et al.*, 1968	(d-3)
Morton, J. A., 1946	(b-5)
Neale, 1969	(r-2)
Porter, 1938	(r-2)
Rising & Ryan, July 1966	(g-5)
Rising & Ryan, Aug. 1966	(t-2c)
Rosenbloom, *et al.*, 1966	(f-4)
Sanderson & Anderson, 1960	(f-4)
Sawin, 1951	(g-5)
Stone, V. W., 1959	(f-4)
Swineford, Mar. 1949	(g-4)
Travers, 1967	(a-5b)
Turner, 1937	(a-2)
Westley & Jacobson, 1963	(d-4)
Wright, E. M. J., 1959	(f-1a)

Brandenburg, W. J. Modernization of School Mathematics in Holland. Am. Math. Monthly 74: 57-60; Jan. 1967. (c-21, f-4, t-2b)

A modern mathematics course for teachers had little effect on students' understanding of intersection.

(I) background of teachers. (D) understanding of students.

a; ---; 1-only; 164 students; 1.4; sec.; ---; non-norm; ---.

Fehr, Howard F. The Mathematics Education of Youth. Teach. Col. Rec. 60: 179-190; Jan. 1959.

Sixteen countries supplied the writer with a summary of kind and amount of mathematical instruction received by students up to age fifteen. An overall view is presented in terms of 1) content included, 2) sequence and time, 3) class organization, 4) methods of instruction, 5) preparation of teachers, and 6) trends.

d; ---; ---; 16 countries; ---; elem., sec.; ---; ---; ---.

Fremer, John; Coffman, William E.; and Taylor, Philip H. The College Board Scholastic Aptitude Test as a Predictor of Academic Achievement in Secondary Schools in England. J. Ed. Meas. 5: 235-241; Fall 1968. (f-2c)

British students scored higher than U.S. students on the aptitude test.

(I) type of school and background. (D) aptitude scores.

f; ---; 1-only; 1008 students; 1.4, 6.3; grs. 10-12; ---; norm; ---.

Jahn, Harvey R. and Medlin, William K. Reforms in Mathematics Education for Secondary Schools: Historical Trends in Russian and American Education, Final Report. Feb. 1969. (ERIC Document No. ED 029 793) (a-1, b-3)

Mathematics education in Russia was found to have retained "significant amounts of its heritage" during the 1917-1930 period.

d; ---; ---; ---; ---; sec.; ---; ---; ---.

International comparisons (a-7)

Johnson, Richard T. and Anderson, Robert A. Arithmetic Achievement in England and Central Minnesota. Arith. Teach. 11: 176-180; Mar. 1964. (e-5)

1) Intelligence test scores were highest for English grammar and American private school students.
2) When adjustment was made for the effect of IQ, scores of American students on an American achievement test were significantly higher than those of English students on the same test, while the English students were significantly higher on the English test.

(I) type of school and background. (D) achievement.

f; ---; 2-r, 3-r; 2099 students; 1.4, 3.3, 3.5; gr. 9; ---; norm,

non-norm; ---.

Miller, G. H. Algebra in the U.S.S.R.: A Comparative Study on the Junior High Level. Sch. Sci. Math. 61: 119-128; Feb. 1961. (c-22)

Scope and sequence of the Russian algebra program were presented. Russian and American texts contained approximately the same content of traditional topics, but grade placement was lower in Russia and algebra was taught to all students.

d; ---; ---; ---; ---; grs. 7-9; ---; ---; ---.

Miller, G. H. Mathematics Education in Europe. Sch. Sci. Math. 62: 26-34; Jan. 1962.

Length of instruction, number of days, general course content, trends and implications of European programs were presented.

s; ---; ---; ---; ---; sec.; ---; ---; ---.

Miller, G. H. Geometry in the Secondary Schools of Greece: A Comparative Study. Sch. Sci. Math. 66: 817-822; Dec. 1966. (c-23)

In Greece, geometry is taught from grades 7 through 12, with emphasis on solid geometry. Cosmography is taught in grade 12, and projective and analytic geometry are provided for the college-bound.

d; ---; ---; ---; ---; grs. 7-12; ---; ---; ---.

Pella, Milton B. Some Observations Concerning Science and Mathematics Instruction in Three Countries of the Middle East. Sch. Sci. Math. 65: 729-737; Nov. 1965. (t-2d)

A report on the status of science and mathematics instruction, as well as the status of teachers in Syria, Jordan and Lebanon was presented.

d; ---; ---; ---; ---; grs. K-12; ---; ---; ---.

Sato, Ryoichiro. Commentary on the International Study of Achievement in Mathematics. Arith. Teach. 15: 103-107; Feb. 1968. (f-1b)

Opinions and viewpoints are given concerning the higher performance of Japanese students compared to United States students on international mathematics test scores.

d; ---; ---; ---; 1.4, 1.6; grs. 8, 12; ---; norm; ---.

Tracy, Neal H. A Comparison of Test Results: North Carolina, California, and England. Arith. Teach. 6: 199-202; Oct. 1959. (f-2)

Students aged 10-8 to 11-7 from North Carolina scored significantly higher than the comparable California group, though still significantly lower than the English group. Between English groups aged 10-8 to 11-7 and North Carolina eighth graders, no significant differences in total achievement were found. The North Carolina group was significantly higher on problems involving reading ability and concept mastery, and significantly lower on those requiring conversion.

(I) national educational background. (D) achievement differences.

f; ---; 1-only; 7119 students; 1.1, 1.4, 1.10; grs. 6, 8; ---;

non-norm; ---.

Vogeli, Bruce R. Recent Revisions in Soviet Mathematics Education. Sch. Sci. Math. 60: 425-438; June 1960. (b-3, b-5, b-6)

Revisions necessitated by a change from a 10-year plan to an 8-plus-3-year plan were discussed, with the scope for each year of mathematics outlined.

d; ---; ---; ---; 1.6; ages 7-17; ---; ---; ---.

International comparisons (a-7)

Wade, Newman A. Instructional Programs in Scottish Primary Schools Compared with Elementary-School Programs in the United States. *El. Sch. J.* 42: 515-523; Mar. 1942. (b-6)

Scottish students spent more time on arithmetic in seven years than American students spent in eight years; achievement was comparable.

d; ---; 1-only; ---; 1.1, 1.3, 1.6; grs. 1-8; ---; ---; ---.

Wirszup, Izaak. Current School Mathematics Curricula in the Soviet Union and Other Communist Countries. *Math. Teach.* 52: 334-346; May 1959.

The curricula in the Soviet Union, Poland, and other Communist countries were presented in detail.

d; ---; ---; ---; ---; elem., sec.; ---; ---; ---.

---. *General Secondary School Curriculum in the Asian Region.* Bulletin of the UNESCO Regionsl Office for Education in Asia, Vol. III, No. 2. Mar. 1969. (ERIC Document No. ED 029 742) (b-6)

More time was being allocated for mathematics and science than for other subjects in 19 Asian countries.

s; ---; ---; ---; ---; sec.; ---; ---; ---.

Other References

Buell, 1963	(r-2)
Chen & Chow, 1948	(f-1a)
Cramer, 1936	(f-1b)
Postlethwaite (Editor), 1969	(r-2)
Wiersma, 1967	(t-1a)
ERIC Document No. ED 023 584, 1967	(d-1)

Pre-first grade concepts (b-1)

[No research reports were assigned with a primary reference to this category.]

Other Reference

Olander, C. E., 1957 (c-9)

Readiness (b-2)

[No research reports were assigned with a primary reference to this category.]

Other Reference

Leake, 1965	(c-16)

Alspaugh, John W. and Delon, Floyd G. How Modern Is Today's Secondary Mathematics Curriculum? Math. Teach. 60: 50-55; Jan. 1967.

Courses and topics taught in Missouri secondary schools were surveyed. Algebra was found to be the major area of revision, with geometry only slightly revised, while solid geometry and trigonometry were disappearing as separate courses.

s; ---; 2-r; 50 schools; 1.6; sec.; ---; ---; ---.

Bushnell, Don D. The Production and Validation of Educational Systems Packages for Occupational Training of Depressed Area Students, Final Report. Mar. 30, 1966. (ERIC Document No. ED 010 014) (c-21, d-2)

A unit revised in tutorial sessions resulted in higher scores than one prepared by teachers alone.

(I) tutorially or teacher-developed units. (D) achievement.

a; ---; 1-only; 100 students; ---; gr. 10; ---; ---; ---.

Gordon, C. Wayne. Preliminary Evaluation Report on the Los Angeles City Schools, SB 28 Demonstration Program in Mathematics. Oct. 1969. (ERIC Document No. ED 034 686)

This preliminary report described the Model Mathematics Project and presented some unanalyzed data.

(I) use of developmental materials. (D) achievement.

a; ---; 2-s; ---; ---; grs. 7, 8; ---; ---; ---.

Hawkinson, Lawrence Drew. The Contributions to the Secondary Mathematics Curriculum of Three Schools in the Philosophy of Mathematics. 1967. (ERIC Document No. ED 027 181)

Fundamental concepts in mathematics, which were judged to have philosophical bases and which were treated in courses in secondary schools, were identified.

d; ---; ---; ---; ---; sec.; ---; ---; ---.

Content organization and inclusion (b-3)

Irvin, Lee. The Organization of Instruction in Arithmetic and Basic Mathematics in Selected Secondary Schools. Math. Teach. 46: 235-240; Apr. 1953.

Practices for providing for individual differences were reported; recommendations for curriculum revision were made.

s; ---; 1-only; 92 schools; 1.6; sec.; ---; ---; ---.

Johnson, Alvin W. Trends in High School Mathematics. Sch. Sci. Math. 36: 468-470; May 1936. (a-1, c-22, c-23, c-24)

A general decrease in number of mathematics courses offered between 1899 and 1935 was noted in Nebraska.

s; ---; 1-only; ---; 1.6; sec.; ---; ---; ---.

Kohlbrenner, Bernard J. and Walker, Leland S. The Effects of Exploratory Mathematics Upon Formal Algebra. Sch Sci. Math. 32: 48-52; Jan. 1932. (c-22)

Exploratory mathematics courses in grades 7 and 8 had little lasting effect on students' algebra grades.

(I) exploratory course background (city) or none (rural).
(D) achievement (grades).

f; ---; 1-only; 365 students; 1.4; gr. 9; ---; ---; ---.

Mallinson, George Greisen; Marburger, Walter G.; Miller, David J.; Osborn, Gerald; and Worth, Donald. Final Report to the Central Association of Science and Mathematics Teachers of Its Committee on the Significance of Mathematics and Science in Education. Sch. Sci. Math. 54: 119-143; Feb. 1954.

While total enrollment in generalized mathematics courses was increasing, enrollment in specialized courses was decreasing.

s; ---; ---; ---; 1.6; sec.; ---; ---; ---.

McCamey, Kathryn. Objectives of Ninth-Grade Mathematics in Recent Courses of Study. *Sch. Sci. Math.* 38: 972-975; Dec. 1938.

Two-thirds of the courses of study were found to present conventional programs; half listed general objectives. Algebra was the predominant course offered in grade 9.

d; ---; ---; 53 guides; 1.6; gr. 9; ---; ---; ---.

Orleans, Joseph B. An Experiment with the Mathematics of the Eleventh Year. *Math. Teach.* 23: 477-488; Dec. 1930. (c-22, c-24)

After a course combining intermediate algebra and trigonometry, 75 per cent passed a non-standardized test; fewer than usual passed Regents examinations.

(I) type of course. (D) achievement.

a; ---; 2-s, 3-s; 154 students; 1.3, 1.4, 1.6; gr. 11; 1 yr.;

non-norm; ---.

Renner, John W. Course Patterns in Mathematics Studied by High School Students. *Sch. Sci. Math.* 55: 644-650; Nov. 1955. (f-1b)

Students with the highest achievement test scores had enrolled in more mathematics courses. Those following conventional course pattern scored higher than those in non-conventional patterns. For students who took only one year of mathematics, algebra was more effective than general mathematics; either course was effective if more courses were taken.

(I) conventional or non-conventional course patterns.
(D) achievement.

f; ---; ---; 1277 students; 1.4, 3.3, 3.4, 3.5; gr. 12; ---; norm;

---.

Reys, Robert E.; Kerr, R. D.; and Alspaugh, John W. Mathematics Curriculum Change in Missouri Secondary Schools. *Sch. & Com.* 56: 6-7, 9; Dec. 1969. (b-5)

Between 1965 and 1968, a general lowering of grade placement of courses occurred and new courses were added.

s; ---; 2-r; 233 teachers; 1.6; grs. 7-12; ---; ---; ---.

Schaaf, William L. Current Trends in Junior High School Mathematics. Sch. Sci. Math. 35: 959-969; Dec. 1935.

Findings from a 12-item questionnaire were cited, with no clear trends evident.

s; ---; 1-only; 152 teachers; 1.6; grs. 7-9; ---; ---; ---.

Schenberg, Samuel. A Study of Courses and Pupils in Science and Mathematics. High Points 39: 22-48; June 1957.

About 88 per cent of the students elected one or more mathematics courses; data for specific courses and career choices were cited.

s; ---; ---; 27,756 students; 1.6; gr. 12; ---; ---; ---.

Stone, Charles A. A Combined Course in Plane and Solid Geometry? Math. Teach. 24: 160-165; Mar. 1931. (c-23)

Most teachers surveyed were in favor of keeping solid geometry in the high school curriculum; most opposed fusing plane and solid geometry. Students using such a course scored as well in plane geometry but not as well in solid geometry as those having separate courses.

s; ---; 2-s; 140 teachers; 1.1; in-service; ---; ---; ---.

Truenfels, Edith S. Offerings and Enrollments in Mathematics. Am. Math. Monthly 68: 1000-1003; Dec. 1961.

The mathematics curriculum was being revised in 40 per cent of the schools surveyed. Data on specific courses offered were cited.

s; ---; 2-r; 4254 schools; 1.6; grs. 8-12; ---; ---; ---.

Werner, Sister Marijane. Computer-Assisted Planning and Scheduling of Individualized Programs of Study in Science and Mathematics at the Secondary Level. J. Ed. Res. 64: 127-132; Nov. 1970. (ERIC Document No. EJ 028 462) (a-5i, d-6b)

Use of the computer program for PERT, a form of critical path analysis, was found to aid in the ordering of interrelated units of study in mathematics.

d; ---; ---; 312 teachers; ---; sec.; ---; ---; ---.

Whitcraft, L. H. The Influence of the College Entrance Examinations on the Teaching of Secondary Mathematics. Math. Teach. 26: 257-270; May 1933. (f-1)

Educators felt that the College Board examinations influenced the mathematics curriculum; textbooks cited the examinations. Specific effects were discussed.

s; ---; 1-only; 123 teachers, 47 superintendents; 1.1, 1.6;

in-service; ---; ---; ---.

Williams, S. Irene. A Survey of the Teaching of Mathematics in Secondary Schools. Sch. & Soc. 98: 244-246; Apr. 1970. (ERIC Document No. EJ 018 410; ED 029 787)

Data from college-board tests indicated that some of the recommendations of experimental programs have begun to receive wide acceptance, and some topics recommended by the Commission on Mathematics were being integrated into the mathematics program.

s; ---; ---; ---; ---; sec.; ---; ---; ---.

Williams, S. Irene. A Progress Report on the Implementation of the Recommendations of the Commission on Mathematics. Math. Teach. 63: 461-468; Oct. 1970. (ERIC Document No. EJ 026 602)

Commission recommendations on topics were compared with students' responses about whether and/or when each had been included in their programs. A number of topics considered to exemplify contemporary mathematics were studied by more than 50 per cent.

s; ---; 2-s; 1910 students; 1.6; gr. 12; ---; ---; ---.

Content organization and inclusion (b-3)

Wright, Grace S. Trends in High-School Graduation Requirements at the State Level. Sch. R. 64: 178-180; Apr. 1956.

Requirement of mathematics courses decreased between 1932 and 1956.

s; ---; ---; ---; 1.6; sec.; ---; ---; ---.

Other References

Alspaugh, Kerr, & Reys, 1970	(a-1)
Baker, 1962	(e-3b)
Brown, J. L., 1970	(d-5)
Brown, K. E. & Abell, T. L., Nov. 1966	(r-2)
Cassidy, June 1941a	(c-26)
Cassidy, June 1941b	(c-26)
Della-Piana, *et al.*, 1965	(a-4)
Jahn & Medlin, 1969	(a-7)
Kilzer & Thompson, 1935	(d-1)
Leissa & Fisher, 1960	(t-2c)
Niedermeyer, Brown, & Sulzen, 1969	(d-5)
Pauley, 1961	(e-3b)
Price, H. V., 1949	(c-23)
Richtmeyer, 1938	(t-2b)
Vogeli, 1960	(a-7)
Williams, R. L., 1931	(d-1)
ERIC Document No. ED 023 584, 1967	(d-1)

Fitzgerald, William M. On the Learning of Mathematics by Children. Math. Teach. 56: 517-521; Nov. 1963. (f-2, g-4)

The data illustrated the diversity and overlap of scores, indicating ability to learn mathematics is an individual characteristic.

s; ---; 1-only; 4 classes; 1.4; grs. 5, 7, 9; ---; norm, non-norm; ---.

Flanders, Ned Allen. Verbalization and Learning in the Classroom. El. Sch. J. 48: 385-392; Mar. 1948. (f-2)

A correlation of .72 was found between the operating level of statements made by students and final scores on two arithmetic tests. Consistent, insignificant correlations were found between the distribution of statements in the content categories and various criteria of learning.

r; ---; 1-only; 22 students; 1.1, 6.4; gr. 7; 4 wks.; non-norm; ---.

Glennon, Vincent J. Testing Meanings in Arithmetic. Suppl. Ed. Monog. 70: 64-74; 1949. (f-1b, t-1a, t-2a)

Results from a test of basic mathematical understanding indicate the following levels of attainment: grade 7, 12.5 per cent; grade 8, 14 per cent; grade 9, 18 per cent; grade 12, 37 per cent; freshmen, 44.3 per cent; seniors, 42.7 per cent; teachers, 54.8 per cent.

s; ---; 2-s; ---; 1.6; grs. 7-9, 12, pre- and in-service; ---; norm; ---.

Glennon, Vincent Joseph. A Study of the Growth and Mastery of Certain Basic Mathematical Understandings on Seven Educational Levels. Harvard Ed. R. 19: 62-64; Winter 1949. (f-1b, t-1a, t-2a)

Fifteen specific findings were stated, leading to the conclusion that the persons tested had not acquired a satisfactory knowledge of the understandings involved in elementary school arithmetic.

s; ---; 1-only; 1139 students; ---; grs. 7-9, 12, pre- and in-service; ---; non-norm; ---.

Quantitative understanding (b-4)

Rappaport, David. Understanding Meanings in Arithmetic. Arith. Teach. 5: 96-99; Mar. 1958. (a-4)

1) The students did not have an adequate understanding of meanings in arithmetic, assuming a score below 50 per cent was inadequate.
2) Computational skill was not an indication of the understanding of meanings of processes used in computation.
3) Correlations between computation and meanings tests were .63 for each total grade, lower for sub-groups.

s; ---; 1-only; 381 students; 1.4, 1.6, 6.4; grs. 7, 8; ---; norm,

non-norm; ---.

Thurlow, Virginia. Mathematical Understanding of Seventh- and Eighth-Grade Pupils, 1948 and 1963. Arith. Teach. 12: 43-44; Jan. 1965.

The average scores of students tested at the end of grades 7 and 8 were 31.05 per cent for grade 7 and 39.76 per cent for grade 8 on Glennon's test.

s; ---; 1-only; 488 students; 1.6; grs. 7, 8; ---; non-norm; ---.

Other Reference

Johnson, J. T., 1944 (f-1b)

Johnson, John T. Grade Placement of Mathematics Units. Chicago Sch. J. 22: 171-175; Apr. 1941. (f-1b)

Following changes in placement of topics, three forms of a test given over a two-and-one-half year period revealed gains at each grade level, with a 19.8 per cent overall gain.

s; ---; 1-only; 75,000 students; 1.3, 1.4, 1.6; grs. 3-8; 2 1/2

yrs.; norm; ---.

Morton, John A. A Study of Children's Mathematical Interest Questions as a Clue to Grade Placement of Arithmetic Topics. J. Ed. Psychol. 37: 293-315; May 1946. (a-6)

1) Mathematical questions asked by children about aviation were tabulated for each grade level. Primary emphasis in every grade was on quantity, followed by height and speed. Specific data for each type of question was noted.
2) The relation to curriculum, and suggestions about placement of topics and the need to develop the study of aviation were made.

s; ---; 1-only; 3262 students; 1.1; grs. 1-8; ---; ---; ---.

Sax, Gilbert and Ottina, John R. The Arithmetic Achievement of Pupils Differing in School Experience. Calif. J. Ed. Res. 9: 15-19; Jan. 1958. (a-3, f-2)

No significant differences in computational skills in grades 5, 6, and 7 were found between groups who began arithmetic in first grade and those who began in fifth grade. For grades 7 and 8, achievement in meaning scores favored groups in which arithmetic had been postponed.

(I) formal arithmetic programs beginning in first or fifth grade.
(D) achievement.

f; ---; 2-s, 3-m; 193 students; 3.4; grs. 3-8; ---; norm, non-norm;

---.

Grade placement (b-5)

Stone, Charles A. The Place of Plane Geometry in the Secondary School Curriculum. Sch. Sci. Math. 37: 72-76; Jan. 1937. (c-23, f-1b)

Grade 11 geometry students achieved higher scores on all sections of the test than did grade 10 geometry students; it is suggested that plane geometry should be placed above grade 10.

(I) geometry in grade 10 or 11. (D) achievement.

f; ---; 1-only; 25 schools; 1.3; grs. 10, 11; ---; ---; ---.

Washburne, Carleton. Mental Age and the Arithmetic Curriculum: A Summary of the Committee of Seven Grade Placement Investigations to Date. J. Ed. Res. 23: 210-231; Mar. 1931. (f-2b)

The stages of development at which it was most feasible to teach a topic were found by having many children who represented a wide spread of mental ages taught the same topic for the same length of time and by the same method, by testing all these children with the same test six weeks later, and by comparing retention scores. Graphs showed the mental age after which a topic may be taught and retained by 80 per cent; addition facts under 10, 6-9; addition facts over 10, 7-4; subtraction facts under 10, 6-7; subtraction facts over 10, 7-8; subtraction with borrowing or carrying, 8-9; meaning of fractions, 9-0; multiplication facts, 10-2 or later; compound multiplication, 10-4; addition and subtraction of fractions, 9-10 to 13-10; decimals, 11-0; short division, 11-4; percentage, 12-4; long division, 12-7. (Children who had already mastered the process were excluded; all included had to pass prerequisite tests.)

s; ---; 2-s; 148 cities; 1.4; grs. 1-8; 5 yrs.; ---; ---.

Weiss, Sol. What Mathematics Shall We Teach the Low Achiever? Math. Teach. 62: 571-575; Nov. 1969. (ERIC Document No. EJ 010 396) (e-2)

Leading mathematics educators rated 47 possible topics for inclusion in a program for low achievers. Only "vectors", "linear programming", and "truth tables" were rejected. A division of opinion on "social arithmetic" was evident.

s; ---; 2-s; 155 educators; 1.6, 1.7; jr. high; ---; ---; ---.

Wetherington, Julia. Grade Placement of the Content of Arithmetic. *El. Sch. J.* 37: 41-46; Sept. 1936. (d-1)

The frequency with which 78 topics were included in courses of study at each grade level are enumerated in written and chart form. The greatest variety of items (72) was in grade 7. The consistency with which items appeared in the various courses of study was greatest in grade 5, second in grade 6, and lowest in grade 7.

d; ---; ---; 10 courses of study; 1.1; grs. 5-7; ---; ---; ---.

Other References

Alspaugh, Kerr, & Reys, 1970	**(a-1)**
D'Augustine, 1966	**(c-11)**
Holmes & Finley, 1957	**(f-2a)**
Johnson, J. T., 1943	**(f-1b)**
Meyen & Hieronymus, 1970	**(e-2c)**
Reys, Kerr, & Alspaugh, Dec. 1969	**(b-3)**
Vogeli, 1960	**(a-7)**

Time allotment (b-6)

Denman, George E. and Kirby, Thomas J. The Length of the Period and Pupil Achievement in High School. Sch. R. 41: 284-289; Apr. 1933.

Students having long class periods (55-65 minutes) scored significantly higher in algebra and geometry than students having short periods (40-45 minutes).

(I) length of class period. (D) achievement.

f; ---; 2-r, 3-m; 32 schools; 1.1, 1.4, 1.5, 3.15; grs. 9, 10; ---;

---; ---.

Ellis, Emmett. Recitation Frequency and Pupil Achievement. Peabody J. Ed. 14: 80-82; Sept. 1936.

Five days of recitation per week appeared preferable to four days.

(I) amount of recitation. (D) achievement.

a; ---; 2-s; 2 classes; 1.4, 1.5; gr. 9; 12 wks.; norm, non-norm;

---.

Guiler, W. S. and Hoffman, H. B. Dividing Mathematics Time Between Arithmetic and Algebra. Sch. R. 51: 471-475; Oct. 1943. (c-22, e-1a)

Students who spent about one-fourth of class time on remedial arithmetic scored as well on algebra tests and gained more on arithmetic tests as students who worked only on algebra.

(I) algebra with or without remedial arithmetic. (D) achievement.

e; 3.4; 1-only; 109 students; 1.4; gr. 9; 18 wks.; norm;

31 (3, 3, 3, 4, 4, 4, 4, 3, 3).

Hagan, Anastasia M. An Analysis of the Relationship of Scheduled Class Time and Achievement Under Two Methods of Instruction. June 1967. (ERIC Document No. ED 030 203)

Achievement was found to be inversely related to the amount of scheduled class time, but not related to type of textbook.

(I) programmed or conventional textbooks; time. (D) achievement; attitude.

e; 3.4; 2-s, 3-s; 42 students; ---; gr. 9; ---; ---; ---.

Zahn, Karl G. Use of Class Time in Eighth-Grade Arithmetic. Arith. Teach. 13: 113-120; Feb. 1966. (a-4, a-5a)

1) Students who spent 56 per cent or 67 per cent of their time on developmental activities scored higher than those who spent the greater proportion of their time on practice.
2) Boys achieved more than girls.
3) Middle and lower ability groups were not affected differently by the time variation, while the upper ability group having 67 per cent drill achieved significantly higher than those having more practice time.

(I) varying amount of time for developmental and practice activities; ability levels. (D) achievement.

e; 2.9; 2-m, 3-r; 120 students; 1.4, 2.6, 3.2, 3.3, 3.4; gr. 8;

18 wks.; norm; 15 (2, 1, 2, 2, 2, 2, 1, 1, 2).

Other References

Vogeli, 1960	(a-7)
Wade, 1942	(a-7)
ERIC Document No. ED 029 742, 1969	(a-7)

Counting (c-1)

[No research reports were assigned to this category.]

Flournoy, Frances. Applying Basic Mathematical Ideas in Arithmetic. Arith. Teach. 11: 104-108; Feb. 1964. (f-1a)

On an 18-item test measuring ability to apply basic laws of arithmetic in operations with whole numbers, an error of 30 per cent or greater was found on 15 items, and 50 per cent error or greater on 10 items. Items related to the distributive law were most frequently missed.

s; ---; 1-only; 106 students (4 classes); 1.6; gr. 7; ---; norm,

non-norm; ---.

Holtan, Boyd. An Experimental Study of Patterns of Presenting Transitivity Statements. Math. Teach. 40: 257-258; Mar. 1967. (c-17, c-22)

Students have more difficulty with transitive statements of the type "If a > b and b > c, then a > c" than the type "If b > c and a > b, then a > c". It is concluded that both types should be presented.

(I) type of statement. (D) achievement.

e; 3.19; 2-s; 240 students (9 classes); 1.4, 3.4; grs. 7-9; ---;

non-norm; 35 (4, 4, 3, 5, 5, 4, 3, 3, 4).

Pratt, K. C.; Hartmann, W. E.; and Mead, J. L. Indeterminate Number Concepts: III. Representation by Children Through Selection of Appropriate Aggregations. J. Genet. Psychol. 84: 39-63; 1953.

Data on how children apply indeterminate number words (e.g., some, many) were presented.

s; ---; 1-only; ---; 1.4, 3.15; grs. 2-3, 6-7, 10-11; ---; non-norm;

---.

Scaramuzzi, Louis E. Money Is Only Imaginary. Clearing House 30: 280-283; Jan. 1956. (c-8, e-3, f-4, g-5)

The activities of a class exposed to a creative teacher were presented.

Number properties and relations (c-2)

c; ---; 1-only; 1 class; ---; gr. 8; ---; ---; ---.

Other References

Eigen, 1962	(d-5)
Johnson, J. T., 1952	(d-3)
Wohlwill, 1963	(g-4)

Wilson, Guy M. A New Incidence of Learning for the Fundamentals of Arithmetic. *J. Ed. Res.* 33: 425-433; Feb. 1940.

Data from administrations of Wilson's Addition Process Test were presented to stress the need to work for scores indicating 100 per cent mastery.

s; ---; 1-only; ---; 1.1, 1.3, 1.4, 1.6; grs. 5-8; ---; norm; ---.

Other References

Berglund-Gray, 1939	(a-5b)
Berglund-Gray & Young, 1940	(a-5b)
Foran & Lenaway, 1938	(f-1a)
Glaser, Reynolds, & Fullick, 1966	(d-5)
Grossnickle & Snyder, 1939	(e-1a)
Murphy, G. M., 1968	(f-1b)
Osburn, W. J. & Foltz, P. J., 1931	(g-2)
Price, J. E., 1963	(d-5)
Schorling, 1931	(f-2)
Williams, C. L. & Whitaker, R. L., 1937	(e-1a)

Whole numbers: Addition (c-3a)

[No research reports were assigned with a primary reference to this category.]

Other References

Kersh, 1962	(a-4)
Smith, T. A. & Shaw, C. N., 1969	(f-1a)

Johnson, J. T. The Efficiency of Decomposition Compared with That of Equal Additions as a Technique in Subtraction of Whole Numbers. Math. Teach. 24: 5-13; Jan. 1931.

A survey of 2,000 cases determined that most people use both the additive and subtractive methods. Use of the equal additions method was faster (14.3%) and more accurate (3.3%) than use of the decomposition method.

s; ---; 1-only; 693 students; 1.1, 1.4, 1.5, 1.6, 3.17; grs. 5, 6,

8, college students, teachers; 2 testings; non-norm; ---.

Rheins, Gladys B. and Rheins, Joel J. A Comparison of Two Methods of Compound Subtraction. Arith. Teach. 2: 63-69; Oct. 1955.

1) No significant differences were found between the two methods of subtraction with respect to speed or problem solving. Subjects who used the decomposition method were more accurate than those who used the equal additions method.
2) For the less intelligent group the decomposition method was significantly more accurate; for the more intelligent group, no differences were found.

(I) use of decomposition or equal additions method of subtraction (after 5 years). (D) speed; accuracy.

f; ---; 2-s, 3-m; 70 students; 1.5, 3.15, 6.4; gr. 8; 1 testing;

non-norm; ---.

Other Reference

Olander, H. T. & Brown,
B. I., 1959 (a-5d)

Whole numbers: Multiplication (c-3c)

[No research reports were assigned with a primary reference to this category.]

Other References

Gibney, T. C., 1962	(e-2b)
Grossnickle, May 1936	(g-1)

Grossnickle, Foster E. Practice Material in the Estimation of the Quotient in Long Division Found in Current Textbooks. El. Sch. J. 33: 130-141; Oct. 1932. (a-5a, d-1)

Textbooks from the 1925-1931 period varied in the amount and types of practice offered on each of the classifications proposed by the writer. Textbooks teaching the apparent method provided the most practice in estimation. The need for research to show how much practice is necessary for learning was proposed.

d; ---; ---; 9 textbook series; 1.1, 1.6; grs. 3-8; ---; ---; ---.

Grossnickle, Foster E. An Experiment with a One-Figure Divisor in Short and Long Division. I. El. Sch. J. 34: 496-506; Mar. 1934.

Students who had been taught to use only the short form of division with a one-figure divisor were tested. More errors were made by the groups using only the short form, but more time was required by those using the long form. This difference was significant except at grades 5 and 6.

s; ---; 2-s, r; 2365 students; 1.1, 1.4, 3.17, 3.18; grs. 5-12,

college; 1-2 days; non-norm; ---.

Grossnickle, Foster E. An Experiment with a One-Figure Divisor in Short and Long Division. II. El. Sch. J. 34: 590-599; Apr. 1934.

Data from a previous study were analyzed in terms of easy and difficult parts of the test. Less time was used by those using the short form of division on easy examples. Intelligence had no appreciable effect on accuracy. The superior intelligence group solved examples in less time using the short form, but there were no significant differences on the long form. There were some small positive correlations between accuracy and speed. It was concluded that the data do not warrant teaching the short form.

s; ---; ---; 2365 students; 1.4, 1.5, 3.17, 3.18, 6.4; grs. 5-12,

college; 1-2 days; norm, non-norm; ---.

Whole numbers: Division (c-3d)

Grossnickle, Foster E. Reliability of Diagnosis of Certain Types of Errors in Long Division with a One-Figure Divisor. J. Exp. Ed. 4: 7-16; Sept. 1935. (e-1a)

The study was made to determine the consistency of an incorrect response to a basic fact in subtraction and in multiplication during long division with a one-figure divisor.

1) In about 91 per cent of the subtraction cases and 80 per cent of the multiplication cases, only one of the possible responses to a fact was incorrect.
2) There was a greater tendency for an error to be consistent for the difficult facts than for the easier facts.
3) Reliable diagnosis of a student's knowledge could be made in only 2 per cent of the subtraction cases and 5 per cent of the multiplication facts.
4) For diagnostic purposes students must be given opportunity to make at least three responses to each fact.

s; ---; 1-only; 2200 students; 1.1, 1.6, 1.7; grs. 5-15; ---; ---; ---.

Olander, Herbert T. and Sharp, E. Preston. Long Division Versus Short Division. J. Ed. Res. 26: 6-11; Sept. 1932.

1) Three out of four students from grades 4 through 12 chose to work difficult examples in division with single-digit divisors by long division.
2) Little difference in choice of method could be attributed to grade level, but teacher factors seemed to be the greatest determinant.
3) A slightly stronger tendency toward short division by good students was noted.
4) Students used the long division method with greater accuracy.

s; ---; 1-only; 1265 students; 1.1, 1.6; grs. 4-12; ---; ---; ---.

Other References

Grossnickle, Jan. 1936	(e-1a)	Grossnickle, Jan. 1941	(f-2)
Grossnickle, May 1936	(g-1)		

Collier, Myrtle. Relearning Fractions. Sch. Sci. Math. 33: 389-393; Apr. 1933.

Accuracy and speed increased when students were taught to consider fractions as ratios of two numbers.

(I) review on fractions. (D) accuracy; speed.

a; ---; 1-only; 186 students; 1.6; sec.; ---; ---; ---.

Guiler, Walter Scribner. Difficulties in Fractions Encountered by Ninth-Grade Pupils. El. Sch. J. 46: 146-156; Nov. 1945. (e-1a)

Weaknesses in addition of fractions were manifested by 23 per cent of the students, while approximately 40 per cent had difficulty with each of the other operations with fractions. The specific difficulties for each are presented in chart form and discussed. Faulty computation was a major source of error, as were changing fractions to a common denominator, lack of understanding of the process, use of the wrong process, borrowing, and changing mixed numbers to improper fractions.

s; ---; 1-only; 937 students; 1.1, 1.6; gr. 9; ---; norm; ---.

Schane, Evelyn Bessie. Characteristic Errors in Common Fractions at Different Levels of Intelligence. Pittsburgh Sch. 12: 155-168; Mar. 1938. (e-1a, f-2b)

1) Difficulty in reduction was found to be the most common source of errors in addition of fractions for all levels of intelligence, causing 38.2 per cent of total errors.
2) Difficulty with borrowing accounted for the largest number of errors (39%) in subtracting fractions.
3) Faulty computation caused 30.3 per cent of errors in multiplication of fractions.
4) The most common error in division of fractions was the use of the wrong process (28.2%).

s; ---; 1-only; 274 students; 1.1, 1.6; grs. 6-8; ---; norm; ---.

Fractions (c-4)

Other References

Brydegaard, 1960	(a-4)
Guiler, 1936	(e-1a)
Gundlach, 1936	(f-1b)

Fractions: Addition (c-4a)

[No research reports were assigned to this category.]

Fractions: Subtraction (c-4b)

[No research reports were assigned to this category.]

Fractions: Multiplication (c-4c)

[No research reports were assigned to this category.]

Fractions: Division (c-4d)

Hirsch, Martin. Does Changing the Form of a Problem Affect Its Difficulty? High Points 33: 19-25; Dec. 1951.

1) Three examples were found to differ in difficulty:
   - a) Divide 8 by 2 1/3 - solved by 45.9 per cent.
   - b) Divide 3/4 by 5 - solved by 53 per cent.
   - c) Divide 2 3/4 ÷ 3 1/7 - solved by 63.9 per cent.
2) Further investigation revealed that the use of the division sign aided accuracy; having common fractions for both divisor and dividend made the example simpler; and being able to classify examples to apply rules resulted in more correct solutions.

s; ---; 2-r, 3-s; 327 students; 1.1, 1.6; gr. 8; ---; norm; ---.

Grossnickle, Foster E. Types of Errors in Division of Decimals. El. Sch. J. 42: 184-194; Nov. 1941. (e-1a)

1) More errors were made on a test form in which the student was to insert the decimal point than on any other form. For all grades, about 34 per cent of the errors resulted from faulty placement of the decimal point.
2) Dividing an integer by a decimal was the most difficult of four types.
3) The process of division was not a vital factor in determining a student's score.

s; ---; 1-only; 761 students; 1.1, 1.4, 1.6, 3.18; grs. 6-9; ---;

non-norm; ---.

Grossnickle, Foster E. Some Factors Affecting a Test Score in Division of Decimals. J. Ed. Res. 37: 338-342; Jan. 1944. (f-1a)

1) More examples were solved incorrectly for both easy and difficult examples in division of decimals when examples were arranged in a random sequence than when they were grouped according to types.
2) Number of errors made on easy and difficult examples was not significantly different.

(I) type of test arrangement. (D) achievement.

e; 3.19; 1-only; 409 students; 3.18; grs. 6-8; ---; non-norm;

35 (4, 3, 3, 4, 4, 3, 5, 5, 4).

Guiler, Walter Scribner. Difficulties in Decimals Encountered by Ninth-Grade Pupils. El. Sch. J. 46: 384-393; Mar. 1946. (e-1a, g-2)

Testing of ninth grade students revealed that 6.6 per cent had difficulty with multiplication of decimals; 33 per cent, with addition and subtraction of decimals; 60.7 per cent, with changing fractions to decimals; and over 80 per cent, with changing mixed numbers to decimals and with division of decimals. Specific difficulties in each area are enumerated in charts. Lack of understanding procedures and faulty computation were the chief problems.

s; ---; 1-only; 936 students; 1.1, 1.6; gr. 9; ---, norm; ---.

Decimals (c-5)

Other References

Grossnickle, 1937	(f-1a)
Grossnickle, 1943	(e-1a)
Smith, T. A. & Shaw, C. N., 1969	(f-1a)

Guiler, Walter Scribner. Difficulties in Percentage Encountered by Ninth-Grade Pupils. El. Sch. J. 46: 563-573; June 1946. (e-1a)

Analysis of test data revealed that 51.6 per cent had difficulty finding a per cent of a number; 47.7 per cent, finding what per cent one number is of another; 94.0 per cent, finding a number when a per cent of it is known; 72.7 per cent, finding the result of a per cent increase or decrease; 88.2 per cent, finding a per cent of increase or decrease. Specific subskill difficulties are also tabulated.

s; ---; 1-only; 936 students; 1.1, 1.6; gr. 9; ---; norm; ---.

Kenney, Russell A. and Stockton, Jesse D. An Experimental Study in Teaching Percentage. Arith. Teach. 5: 294-303; Dec. 1958. (a-4)

1) The three upper quarters of all groups made significant progress.

2) There were no significant differences between groups.

(I) drill or meaningful emphases; three levels of intelligence.
(D) achievement.

e; 3.13; 2-s, 3-m; 477 students; 1.1, 1.5, 4.1; gr. 7; 4 wks.

(retention, 2 mos.); non-norm; 33 (2, 4, 4, 5, 5, 4, 3, 3, 3).

Riedesel, Alan. Why Teach Bank Discount? Arith. Teach. 4: 268; Dec. 1957. (d-1)

Eight of nine widely used textbooks have 1 to 4 pages of work concerned with discounting of bank loans.

d; ---; ---; ---; ---; gr. 8; ---; ---; ---.

Tredway, Daniel C. and Hollister, George E. An Experimental Study of Two Approaches to Teaching Percentage. Arith. Teach. 10: 491-492; Dec. 1963. (a-4, g-2)

1) Meaningful teaching of per cent provided significantly better results at all levels of intelligence than rote textbook procedures.

2) The teaching of the three cases of percentage as parts of a whole process provided for better retention for those students of average intelligence.

Percentage (c-6)

(I) rote or meaningful teaching. (D) achievement; retention. e; 3.13 r; 2-s, 3-s; 552 students (22 groups); 1.4, 3.3, 3.5; gr. 7; 20 days (retention after 30 days over 2 yr. period); norm, non-norm; 37 (2, 2, 5, 5, 5, 4, 5, 4, 5).

Ratio and proportion (c-7)

Cowley, E. B. Ratio and Proportion in High School Curriculums. Sch. Sci. Math. 37: 1079-1088; Dec. 1937. (d-1, d-8)

The concept of relationship was found to be increasing in the teaching of ratio and proportion.

s; ---; 1-only; 25 textbooks, 2000 students; 1.6; sec.; ---; ---;

---.

Karplus, Robert and Peterson, Rita W. Intellectual Development Beyond Elementary School. II: Ratio, A Survey. Sch. Sci. Math. 70: 813-820; Dec. 1970. (ERIC Document No. EJ 032 300)

Responses were placed in seven categories, with variations for grade level and suburban-urban location noted. Many twelfth graders could not do proportional reasoning.

s; ---; 1-only; 727 students; 1.6; ages 9-18 (grs. 4-12); ---; ---;

---.

Cohen, Walter; Hershkowitz, Aaron; and Chodack, Marjorie. Size Judgement of Different Distances as a Function of Age Level. Child Develop. 29: 473-479; Dec. 1958.

When the standard was 2 meters from the subject and the comparison stimulus was at 8 meters, there was very little change in size constancy from age 5 to age 12, but an increase in size constancy did occur between the ages of 12 and 17.

(I) size of stimulus card; age. (D) constant error; interval of uncertainty; "PSE"; distance.

e; 2.16; 2-r, 3-s; 42 children; 1.4, 3.2, 3.3, 4.1; ages 5, 7, 12, 17; ---; ---; 26 (4, 1, 3, 3, 4, 4, 2, 3, 2).

Goldstone, Sanford; Boardman, William K.; and Lhamon, William T. Kinesthetic Cues in the Development of Time Concepts. J. Genet. Psychol. 93: 185-190; Oct. 1958.

1) Considerable accuracy was obtained in the estimates of a second by age 8 through young adult groups.
2) The estimates of 6- and 7-year and older groups were significantly shorter.
3) Counting aloud, which involved more muscle activity, resulted in significantly longer estimates of a second.

(I) counting to self or aloud; age level. (D) time.

e; 2.6; 1-only; 230 children; 1.3, 4.3, 4.6; ages 6-14, college, older adults; 1 session; ---; 20 (3, 2, 2, 2, 4, 1, 2, 2, 2).

Gothberg, Laura C. The Mentally Defective Child's Understanding of Time. Am. J. Ment. Def. 53: 441-455; Jan. 1949. (e-2c)

1) Not until the mental age of 5 was reached could at least 50 per cent of the mentally defective children respond to time percepts.
2) Abstract concepts of sequence, historical time, and measurement of duration and chronology were not found to mature until after MA 10 and were beyond the capacity of the majority at MA 12.
3) Knowledge of number of minutes and seconds did not presuppose ability to tell time.
4) A correlation of .89 was found between time questions answered and mental age. With mental age partialled out, a correlation of .31 between time questions and CA was found.

s; ---; 1-only; 155 children, 53 adults; 1.4, 1.6, 6.4; ages 5-19;

---; ---; ---.

Wilson, Dorothy W. Teaching Denominate Numbers and Measures. Ed. Meth. 16: 177-181; Jan. 1937.

After specific percentages for various geographic areas and age levels were presented, it was concluded that experience determines what one knows about units of measure and that teaching in the schools did not have much effect unless it was reinforced by experience.

s; ---; 1-only; 2819 subjects; 1.6; grs. 3-12, adults; ---; ---;

---.

Measurement (c-8)

Other References

Anderson, G. R., 1957	(d-3)
Brotherton, Read, & Pratt, 1948	(d-7)
Cluley, 1932	(g-1)
Elkind, 1961	(g-7a-1)
Estes, 1961	(c-11)
Friebel, 1967	(a-4)
Glaser, Reynolds, & Fullick, 1966	(d-5)
Johnson, J. T., 1952	(d-3)
Murphy, M. O. & Polzin, M. A., 1969	(r-2)
Pick, H. L., Jr. & Pick, A. D., 1967	(g-7d)
Scaramuzzi, 1956	(c-2)

Olander, Clarence E. The Use of a Readiness Test in Teaching a Unit on Signed Numbers. Sch. Sci. Math. 57: 131-138; Feb. 1957. (b-1, f-1a)

Correlation coefficients between readiness for signed numbers test scores and posttest scores were .68 when diagnostic use was made of the tests and .60 when the teacher was uninformed of test results. No significant difference in achievement resulted from use of the readiness test.

(I) diagnostic use of readiness tests. (D) achievement.

e; 3.4; 2-r, 3-s; 2 classes; 3.3, 3.4, 3.15, 6.4; gr. 9; ---;

non-norm; 20 (2, 2, 2, 3, 2, 2, 2, 2, 3).

Other References

Bassler, 1968	(d-5)
Michael, 1949	(a-4)
Scandura, Woodward, & Lee, 1967	(g-3)

Algebra in elementary school (c-10)

[No research reports were assigned with a primary reference to this category.]

Other References

Braverman, 1939	(f-2c)
Cassel & Jerman, 1963	(a-4)
Stephens, 1960	(a-6)

Geometry in elementary
school (c-11)

D'Augustine, Charles. Factors Related to Achievement with Selected Topics in Geometry and Topology Arith. Teach. 13: 192-197; Mar. 1966. (b-5, d-5)

No treatment significantly affected results. Shorter periods were more effective than longer periods. Most efficiency was achieved in grade 6.

(I) grade level; sex; length of instruction period. (D) achievement.

e; 2.12; 2-r, 3-r; 270 students; 1.4, 3.3, 3.4, 3.5; grs. 5-7; ---;

norm, non-norm; 18 (2, 2, 2, 3, 1, 3, 2, 2, 1).

Estes, Betsy Worth. Judgment of Size in Relation to Geometric Shape. Child Develop. 32: 277-286; 1961. (c-8)

1) On similar-figure trials a) subjects were accurate in estimation of equality of size; b) young children were as accurate as adults; c) variability of group judgments decreased with increase in age; d) variability of group judgments decreased with decrease in size presented.

2) On the different-figure trials a) the basis for judgments differed according to standard or variable series; b) cues differed according to shapes of figures; c) same cues were used by all groups regardless of size of figures; d) there were no age or sex differences; e) in one-third of the comparisons, area was used in estimating equality of size.

(I) presentation of varied sizes in similar and different shapes.
(D) degree of accuracy of judgment.

e; 3.19; 1-only; 105 students; 1.4; grs. K, 2, 4, 6, 8, college;

3 sessions; ---; 21 (4, 2, 2, 2, 4, 2, 3, 1, 1).

Kaess, Dale W. Form Constancy and the Perceptual Task: A Developmental Study. J. Exp. Psychol. 83: 465-471; Mar. 1970.

Ability to identify rectangular shapes, rotated in the third dimension, by physical or perspective shape was significantly different at different ages.

(I) type of instruction; type of shape. (D) recognition.

Geometry in elementary school (c-11)

e; 2.8; 2-s, 3-r; 120 students; 3.2, 3.4; ages 8, 13, 18; ---; ---;

19 (4, 2, 2, 1, 3, 2, 1, 2, 2).

Neatrour, Charles R. A Status Survey of the Geometric Content in the Mathematics Curriculum of the Middle School. Sch. Sci. Math. 69: 610-614; Oct. 1969. (ERIC Document No. EJ 010 387)

A survey of textbooks in use and the amount of geometry in the curriculum was followed by a study of the grade level at which various topics were taught.

s; ---; 2-s; 156 schools; 1.6; grs. 5-8; ---; ---; ---.

Other Reference

Henderson & Rollins, 1967 (a-4)

Neimark, Edith D. and Slotnick, Nan S. Development of the Understanding of Logical Connectives. *J. Ed. Psychol.* 61: 451-460; Dec. 1970. (ERIC Document No. EJ 032 261) (c-13)

Inclusion and exclusion were understood by a majority of even the youngest children. Intersection was understood by a majority of all but the youngest children, while union was not understood by the majority except at the college level.

s; ---; ---; 513 students; ---; grs. 3-9, college soph.; ---; ---; ---.

Other References

Bivens, 1964	(g-6b)
Campbell, 1964	(a-4)
Randolph, 1964	(d-5)

Logic and proofs (c-13)

Allen, Robert W. The Fourth "R." *Calif. J. Ed. Res.* 16: 75-79; Mar. 1965.

Students made gains in achievement after a course in logic using WFF'N Proof.

(I) unit on logic. (D) achievement.

a; ---; 1-only; 26 students; 1.4; ages 10-19; 6 wks.; norm, non-norm;

---.

Miller, William A. A Unit in Sentential Logic for Junior High School Students; Involving Both Valid and Invalid Inference Patterns. *Sch. Sci. Math.* 69: 548-552; June 1969. (ERIC Document No. EJ 005 544)

Students were able to test correctly the validity or invalidity of an inference pattern.

(I) use of unit on logic. (D) achievement.

a; ---; 1-only; 1 class; 1.1, 1.4; gr. 7; 12 days; non-norm; ---.

Retzer, Kenneth A. *Effects of Precise Verbalization of Discovered Mathematical Generalizations on Transfer.* Oct. 1969. (ERIC Document No. ED 040 849) (a-4, g-1, g-3)

Students with high verbalization ability could better transfer the mathematical generalizations which they discovered.

(I) verbalization ability. (D) transfer.

e; ---; ---; 7 classes; ---; gr. 8; ---; ---; ---.

Retzer, Kenneth A. and Henderson, Kenneth B. Effect of Teaching Concepts of Logic on Verbalization of Discovered Mathematical Generalizations. *Math. Teach.* 40: 707-710; Nov. 1967. (a-4, g-1, g-3)

Study of logic resulted in greater ability to verbalize mathematical generalizations, especially for the gifted students.

(I) study of logical concepts; ability level. (D) ability to verbalize generalizations.

e; 3.4; 2-s, 3-s; 80 students; 3.2; grs. 7, 8; ---; non-norm;

26 (2, 2, 3, 4, 4, 3, 2, 3, 3).

Roberge, James J. Negation in the Major Premise as a Factor in Children's Deductive Reasoning. *Sch. Sci. Math.* 69: 715-722; Nov. 1969. (ERIC Document No. EJ 012 476)

Negation had a marked influence on the development of logical ability.

s; ---; 2-s, 3-r; 228 students (13 classes); 1.4, 3.2, 3.3;

grs. 4, 6, 8, 10; ---; ---; ---.

Roberge, James J. A Study of Children's Abilities to Reason with Basic Principles of Deductive Reasoning. *Am. Ed. Res. J.* 7: 583-596; Nov. 1970. (ERIC Document No. EJ 030 322) (g-4)

Significant differences were found between grade levels, types of reasoning, principles, and interactions.

f; ---; 2-r, 3-r; 228 students; 1.4, 1.6, 3.2; grs. 4, 6, 8, 10;

---; non-norm; ---.

Other References

Henry, 1934	(g-4)
Moore, W. J. & Cain, R. W., 1968	(g-4)
Neimark & Slotnick, 1970	(c-12)
Scott & Rude, 1970	(c-23)
Ulmer, 1939	(g-4)

The decimal numeration systems (c-14)

Flournoy, Frances; Brandt, Dorothy; and McGregor, Johnnie. Pupil Understanding of the Numeration System. Arith. Teach. 10: 88-92; Feb. 1963. (f-1a)

1) The mean percentage correct on a 25-item test was 60.48.
2) The error was greater than 50 per cent on ten items.
3) Most common errors related to a) additive principle; b) "relative" interpretations; c) meaning of 1000 as 100 tens and as 10 hundreds, etc.; d) expressing powers of ten, as 10,000 = 10 x 10 x 10 x 10; and e) the 10 to 1 relationship in place value.

s; ---; 1-only; 106 students; 1.6; gr. 7; ---; non-norm; ---.

Other References

Banghart & Spraker, 1963	(g-4)
Johnson, J. T., 1952	(d-3)

Holmes, Darrell. An Experiment in Learning Number Systems. Ed. Res. B. 28: 100-104, 111-112; Apr. 1949.

Children who had been taught other number bases the previous year were able to relearn more material than those in a group who had not received such teaching.

(I) previous teaching about other number bases. (D) achievement.

e; 1.3; 2-m, 3-s; 34 students; 1.4, 3.4; gr. 7; ---; non-norm;

41 (3, 4, 5, 5, 5, 5, 4, 5, 5).

Other References

Banghart & Spraker, 1963	(g-4)
Bassler, 1968	(d-5)
Jamison, 1964	(d-3)
Johnson, D. A., 1956	(e-4)
Paige, 1966	(g-6a)

Probability and statistics (c-16)

Leake, Lowell, Jr. The Status of Three Concepts of Probability in Children of Seventh, Eighth and Ninth Grades. J. Exp. Ed. 34: 78-81; Fall 1965. (b-2)

Students were found to have considerable knowledge of probability concepts before being formally taught them. Mental age was found to be more related to achievement of such concepts than was chronological age.

(I) CA; MA. (D) knowledge of probability concepts.

f; ---; 2-r; 72 students; 3.2, 3.3; grs. 7-9; ---; non-norm; ---.

Paley, George L. A Unit of Statistics in Ninth Year Mathematics: An Experiment. High Points 18: 16-25; Sept. 1936. (e-1a)

Students scored well on a test following a unit on statistics.

(I) unit on statistics. (D) achievement.

a; ---; 1-only; 1 class (37 boys); 1.1, 1.3, 1.4; gr. 9; 4 wks.;

non-norm; ---.

Shulte, Albert P. The Effects of a Unit in Probability and Statistics on Students and Teachers of Ninth-Grade General Mathematics. Math. Teach. 63: 56-64; Jan. 1970. (ERIC Document No. EJ 013 954) (c-21)

While the group studying topics in probability and statistics improved significantly on tests measuring such topics, their attitude declined. Studies in the regular general mathematics course improved significantly more on computation tests.

(I) use of experimental unit. (D) achievement; attitude.

e; 3.4; 1-only; 35 classes (5 districts); 3.2, 3.4; gr. 9; 8-9 wks.;

norm, non-norm; 23 (2, 2, 3, 4, 3, 3, 3, 2, 1).

Smock, Charles D. and Belovicz, Gretchen. Understanding of Concepts of Probability Theory by Junior High School Children. Feb. 1968. (ERIC Document No. ED 020 147)

Students failed to understand the basic idea of probability theory.

a; ---; ---; ---; ---; jr. high; ---; ---; ---.

Functions; *graphing* (c-17)

[No research reports were assigned with a primary reference to this category.]

Other References

Cronbach, 1943	(t-2a)
Dessart, 1962	(d-5)
Hartung, 1953	(e-3)
Holtan, 1967	(c-2)

Basic arithmetic procedures
in secondary school (c-20)

Cooke, Dennis H. and Fields, Carl L. The Relation of Arithmetical Ability to Achievement in Algebra and Geometry. *Peabody J. Ed.* 9: 355-361; May 1932. (c-22, c-23)

A significant relationship was found between arithmetical ability and achievement in algebra, and a less significant relationship between intelligence and achievement in algebra. Arithmetical ability did not correlate highly with achievement in geometry.

r; ---; ---; 39 students; 6.3, 6.4; grs. 9, 10; 9 mos.; non-norm; ---.

Lee, William. A Study in the Growth of Arithmetic Power. *Math. Teach.* 41: 180-182; Apr. 1948.

Gains in arithmetic ability were ascertained for students in all high school mathematics classes.

(I) varied mathematics instruction. (D) achievement in arithmetic.

f; ---; 1-only; ---; 1.10; grs. 9-12; 1 yr.; norm; ---.

Other References

Alkire, 1954	(f-2)
Braverman, 1944	(e-2)
Brown, G. W., 1964	(f-1b)
Frost & Brandes, 1956	(f-1a)
Habel, 1951	(d-1)
Ohlsen, 1946	(f-2)
Renner, 1957	(f-1b)

General Mathematics course (c-21)

[No research reports were assigned with a primary reference to this category.]

Other References

Anderson, K. E. & Dixon, L. J., 1952	(f-1b)
Beckmann, 1952	(f-2)
Brandenburg, 1967	(a-7)
Brown, G. W., 1964	(f-1b)
Bushnell, 1966	(b-3)
Campbell, 1964	(a-4)
Dodes, 1954	(e-1)
Douglass, 1935	(r-2)
Easterday, K. & Easterday, H., 1968	(d-5)
Glaser, Reynolds, & Fullick, 1966	(d-5)
Guiler & Hoffman, Sept. 1943	(e-2)
Guilford, Hoepfner, & Peterson, 1965	(f-2c)
Hanna, Bligh, & Lenke, 1970	(f-2c)
Hanna, Bligh, Lenke, & Orleans, 1969	(f-2c)
Hitchcock, 1932	(e-2)
Holtan, 1964	(g-5)
Ivanoff, DeWane, & Praem, 1965	(f-2c)
Jones, T., 1968	(e-2a)
Kilzer & Thompson, 1935	(d-1)
Madden, 1968	(a-3)
Maynard & Strickland, 1969	(a-4)
Nelson, T., 1956	(f-1b)
Novinger, 1942	(d-1)
Price, J., 1967	(a-4)
Randall, R. E., 1953	(f-1b)
Randall, R. E., 1955	(e-1a)
Renner, 1957	(f-1b)
Shulte, 1970	(c-16)
Stokes, 1931	(f-2)

Fowler, H. Seymour. Algebra I--Eighth Grade or Ninth Grade? Sch. Sci. Math. 61: 699-700; Dec. 1961. (f-2c)

Capable eighth graders appeared to succeed as well in Algebra I as ninth graders of similar ability.

s; ---; 1-only; 10 classes; 1.3, 1.4; grs. 8, 9; ---; norm; ---.

Howland, Elizabeth G. Methods of Teaching the Special Products and Their Factors in Ninth Grade Algebra. Sch. Sci. Math. 36: 771-776; Oct. 1936.

When each of the three special products was taught followed immediately by teaching the factoring of that product, it did not result in consistently different achievement and retention than when all three products were taught and then factoring was taught.

(I) "together" or "separate" method of teaching factoring.
(D) achievement; retention.

e; 3.1 r; 2-s; 84 students; 1.3, 1.8; gr. 9; (retention, 7 wks.);

norm; 37 (4, 4, 5, 5, 4, 3, 5, 3, 4).

Schwellenbach, John A. An Experiment in Predicting the Ability of Eighth Grade Students to Work Simple Algebra Problems. Calif. J. Ed. Res. 5: 36-41; Jan. 1954. (f-2c)

A standardized achievement test in arithmetic predicted success in algebra better than an algebra aptitude test.

r; ---; 2-s; 108 students; 1.6, 6.3, 6.4; gr. 8; ---; norm; ---.

Urbancek, Joseph J. Typical Divisions of Ninth Year Algebra. Sch. Sci. Math. 34: 743-751; Oct. 1934. (d-1)

Twenty-three topical divisions were found in algebra textbooks; the number of problems and exercises in each was tabulated.

d; ---; ---; 14 textbooks; 1.6; gr. 9; ---; ---; ---.

Algebra course (c-22)

Other References

Adams & Cole, 1932	(d-2)
Albers & Seagoe, 1947	(e-3)
Anderson, F. H.; Bedford, F.; Clark, V.; & Schipper, J., 1963	(e-3b)
Anderson, K. E. & Dixon, L. J., 1952	(f-1b)
Archer & Woodlen, 1967	(a-4)
Ayers, G. H., Jan. 1934	(f-2c)
Ayers, G. H., Dec. 1934	(f-2c)
Baldauf, 1963	(f-2c)
Barnes & Asher, 1962	(f-2c)
Beberman & Van Horn, 1960	(t-2b)
Beckmann, 1952	(f-2)
Belcastro, Jan. 1966	(a-4)
Belcastro, Spring 1966	(a-4)
Blick & Braman, 1954	(f-2c)
Brown, R. M., 1966	(a-5e)
Buckingham, 1936	(e-1a)
Buckingham, Feb. 1937	(d-7)
Buckingham, Mar. 1937	(d-7)
Cain, 1966	(f-2)
Call & Wiggin, 1966	(d-7)
Calvin & Hanley, 1962	(d-7)
Campbell, *et al.*, 1963	(g-5)
Carpenter & Fillmer, 1965	(d-5)
Chapman, 1962	(e-3b)
Church, *et al.*, 1964	(d-4)
Clark, 1939	(d-7)
Clem & Hendershot, 1930	(e-1a)
Clifton, 1940	(f-2c)
Cooke & Fields, 1932	(c-20)
Crosby & Fremont, 1960	(e-4)
Crosby, *et al.*, 1960	(a-4)
Devine, 1968	(d-5)
Dickter, 1933	(f-2c)
Douglass, 1935	(r-2)
Drake, 1935	(a-4)
Drake, 1940	(d-7)
Dunn, 1937	(f-2c)
Frost & Brandes, 1956	(f-1a)
Gadske, 1933	(e-4)
Greenspan, 1953	(f-2c)
Grime, 1947	(f-2c)
Grover, 1932	(f-2c)
Guiler, 1944	(f-2c)
Guiler & Hoffman, Sept. 1943	(e-2)
Guiler & Hoffman, Oct. 1943	(b-6)
Guilford, Hoepfner, & Peterson, 1965	(f-2c)
Habel, 1951	(d-1)
Hagan, 1967	(b-6)
Hanna, Bligh, & Lenke, 1970	(f-2c)
Hartung, 1953	(e-3)
Hawkins, 1932	(a-5b)
Hegstrom & Riffle, 1963	(e-3b)
Herriot, 1967	(e-2b)
Hickey, *et al.*, 1962	(d-4)
Hirschi, 1958	(a-4)
Hitchcock, 1932	(e-2)
Holtan, 1967	(c-2)

Hountras & Belcastro, 1963	(d-5)
Hunziker & Douglass, 1937	(a-4)
Ivanoff, DeWane, & Praem, 1965	(f-2c)
Jackson, N. A., 1930	(a-5e)
Jackson, N. A., 1931	(g-4)
Jackson, N. A., 1935	(d-7)
Jackson, W. N., 1955	(g-4)
Johnson, A. W., 1936	(b-3)
Kellar, 1939	(a-5b)
Kertes, 1932	(f-2c)
Kilzer & Thompson, 1935	(d-1)
Kinzer & Worcester, 1965	(g-6a)
Kohlbrenner & Walker, 1932	(b-3)
Lahey, 1941	(g-2)
Layton, E. T., 1932	(g-2)
Layton, R. B., 1941	(f-2c)
Lee, D. M. & Lee, J. M., 1931	(f-2)
Lee, J. M. & Hughes, W. H., 1934	(f-2c)
Lindquist, 1934	(f-1b)
Linn, M., 1934	(e-4)
Love, 1969	(e-4)
Lucas, 1967	(d-5)
Lueck, 1948	(a-5b)
MacRae & Uhl, 1932	(e-1a)
Malinen, 1969	(a-4)
McCuen, 1930	(f-2c)
McGarvey, 1962	(d-5)
McQueen & Williams, 1958	(f-2c)
Messler, 1961	(f-2a)
Michael, 1949	(a-4)
Miller, G. H., 1961	(a-7)
Olson, 1934	(d-1)
Orleans, J. B., 1930	(b-3)
Orleans, J. B., Apr. 1934, May 1934	(f-2c)
Orleans, J. B., 1936	(a-5e)
Orleans, J. B. & Orleans, J. S., 1933	(a-4)
Osburn, H. G. & Melton, R. S., 1963	(f-2c)
Paulson, 1964	(g-6b)
Pease, 1930	(e-6)
Pinsky & Gorth, 1969	(f-1a)
Porter, 1938	(f-2)
Pressey, S. L.; Pressey, L. C., & Narragon, F. R., 1932	(d-7)
Raymond, 1964	(d-5)
Renner, 1957	(f-1b)
Richter, 1934	(f-2c)
Rosen & Stolurow, 1964	(g-4)
Rosilda, 1951	(f-2b)
Russell, D. H. & Holmes, F. M., 1941	(d-7)
Ryan, 1967, 1968	(a-6)
Sabers & Feldt, 1968	(f-1a)
Schultz & Ohlsen, 1949	(a-4)
Seagoe, 1938	(f-2c)
Shaver & White, 1966	(e-5)
Shaw, G. S., 1956	(f-2c)
Snider, 1944	(e-1a)
Sobel, 1956	(a-4)
Stallard & Douglass, 1935	(a-4)

Algebra course (c-22)

Stallard & Douglass, 1936	(a-5e)
Stright, 1938	(a-5b)
Sykes, 1935	(d-1)
Tiemens, 1962	(g-5)
Torgerson & Aamodt, 1933	(f-2c)
Unzicker, 1932	(e-3b)
Welton, 1931	(f-1b)
Westley & Jacobson, 1963	(d-4)
Westley & Severin, 1965	(d-4)
Willits, 1944	(a-4)
Wren, 1935	(r-2)
ERIC Document No. ED 026 184, 1965	(d-5)

Boe, Barbara L. Secondary School Pupils' Perception of the Plane Sections of Selected Solid Figures. Technical Report No. 13. Madison: Research and Development Center for Learning and Re-Education, University of Wisconsin, Nov. 1966. (ERIC Document No. ED 010 515) (g-7d)

None of the students demonstrated the ability to draw and identify geometric sections with consistent accuracy.

(I) method of response. (D) achievement.

e; 2.18; 2-r, 3-r; 72 students (5 schools); 1.4, 3.2; grs. 8, 10,

12; 1 day; non-norm; 12 (3, 1, 1, 1, 1, 2, 1, 1, 1).

Boe, Barbara L. A Study of the Ability of Secondary School Pupils to Perceive the Plane Sections of Selected Solid Figures. Math. Teach. 61: 415-421; Apr. 1968. (g-7d)

Ability level, solid figures, and type of cut all significantly affected students' responses to 16 drawing or identifying tasks. Students at age 12 had not achieved mastery of the geometric sections. A correlation of only .55 was found between the two types of response.

(I) age level; geometric sections. (D) identification or drawing tasks.

f; ---; 2-r; 72 students; 3.2, 6.4; grs. 8, 10, 12; ---; ---; ---.

Duncan, Dewey C. A Criticism of the Treatment of the Regular Polygon Constructions in Certain Well-Known Geometry Texts. Sch. Sci. Math. 34: 50-57; Jan. 1934. (d-1)

Textbooks were found to contain little accurate information on construction of regular polygons.

d; ---; ---; 23 textbooks; ---; sec.; ---; ---; ---.

Hess, Adrien L. The Place of Geometric Constructions in Plane Geometry. Sch. Sci. Math. 55: 594-597; Nov. 1955. (d-3, t-2c)

A study based on examination of textbooks, tests, and teachers' opinions regarding the role of constructions in geometry was presented.

Geometry course (c-23)

d; ---; ---; ---; ---; gr. 10; ---; ---; ---.

Murray, John E. An Analysis of Geometry Ability. J. Ed. Psychol. 40: 118-124; Feb. 1949.

The relative contributions of spatial relations, reasoning, numerical, and verbal aptitudes to geometric achievement were determined. Spatial relations were not found to be predominant.

r; ---; 1-only; 255 boys (10 classes); 6.3, 6.4; gr. 10; ---; norm,

non-norm; ---.

Orleans, Joseph B. Demonstrative Geometry in the Ninth Year. Math. Teach. 26: 100-103; Feb. 1933.

Groups taught a unit of demonstrative geometry in algebra achieved well.

(I) unit on geometry. (D) achievement.

a; ---; 2-s; 3 classes; ---; gr. 9; 3 yrs.; ---; ---.

Price, H. Vernon. An Experiment in Fusing Plane and Solid Geometry. Sch. Sci. Math. 49: 199-203; Mar. 1949. (b-3)

Test data suggested that a fused plane-solid geometry course may produce better results than are achieved in separate courses.

(I) type of course. (D) achievement.

a; ---; 1-only; 79 students; 1.4, 1.8, 1.10; sec.; ---; norm; ---.

Scott, C. H. and Rude, Terry. Plane Geometry by Vector Methods. Sch. Sci. Math. 70: 230-238; Mar. 1970. (ERIC Document No. EJ 017 554) (c-13)

In a very limited feasibility study, results indicated that some high school students can be taught geometry by vector methods.

(I) use of two lessons on vectors. (D) achievement.

a; ---; 1-only; 1 class; 1.3, 1.4; gr. 11; 2 days; non-norm; ---.

Wiviott, Suzanne Pasch. Bases of Classification of Geometric Concepts Used by Children of Varying Characteristics. Part I. 1970. (ERIC Document No. ED 046 049) Part II. (ERIC Document No. ED 046 050) (g-4)

An increase in grade level was accompanied by decrease in use of the Perceptible basis of classification and an increase in the Attribute and Nominal. High achievers used the Perceptible category less and the other two categories more than low achievers.

s; 1-only; 96 students; ---; grs. 5, 8, 11; ---; non-norm; ---.

Other References

Amidon & Flanders, 1961	(a-4)
Beane, 1965	(d-5)
Berlin, 1932	(f-2)
Bhushan, Jeffryes, & Nakamura, 1968	(a-4)
Biddle, 1967	(d-5)
Blank, 1933	(r-2)
Blick & Braman, 1954	(f-2c)
Boyer, 1937	(t-2c)
Braverman, 1941	(e-2)
Brinkmann, 1966	(d-5)
Brown, K. E., 1950	(t-2c)
Brown, O. R., Jr., 1967	(d-9)
Brownman, 1938	(a-4)
Burton, E. D., 1939	(d-1)
Butterweck, 1937	(a-1)
Caldwell, Schrader, Michael, & Meyers, 1970	(f-2c)
Calvin & Hanley, 1962	(d-7)
Challman, 1946	(g-2)
Christofferson, 1933	(e-1a)
Cook, L. M., 1943	(g-4)
Cooke & Fields, 1932	(c-20)
Cooke & Pearson, 1933	(f-2c)
Coulson, 1964	(d-5)
Coulson, 1967	(d-5)
Coulson, *et al.*, 1965	(d-5)
Cowley, 1934	(d-7)
Davis & Henrick, 1945	(f-2c)
Flynn, 1969	(e-5)
Foran & O'Hara, 1935	(e-6)
Forseth, 1961	(d-8)
Freeman, 1932	(d-1)
Gibney, E. F., 1949	(e-2)
Goddeyne & Nemzek, 1944	(f-2c)
Griff, 1957	(a-5e)
Hanna, Summer 1966	(f-2c)
Hanna, Nov. 1966	(r-2)
Hanna, 1967	(f-2c)
Hanna, 1968	(t-1a)

Geometry course (c-23)

Hanna & Lenke, 1970	(f-2c)
Henry, 1934	(g-4)
Henry, 1935	(e-1a)
Hines, 1957	(a-5e)
Holzinger & Swineford, 1946	(g-4)
Hummer, 1936	(f-2b)
Hunziker & Douglass, 1937	(a-4)
Johnson, A. W., 1936	(b-3)
Johnson, D. A., 1949	(d-4)
Johnson, D. A., 1950	(d-4)
Jordy, 1964	(d-5)
Lane, R., 1940	(e-3)
Lee, D. M. & Lee, J. M., 1931	(f-2)
Lee, J. M. & Hughes, W. H., 1934	(f-2c)
Lee, J. M. & Lee, D. M., 1932	(f-1a)
Massimiano, 1956	(g-4)
Miller, G. H., 1966	(a-7)
Orleans, J. B., Apr. 1934, May 1934	(f-2c)
Perry, 1931	(f-2c)
Pitts, L. & Davis, R. A., 1931	(g-4)
Porter, 1938	(r-2)
Posamentier, 1966	(d-7)
Pressey, S. L.; Pressey, L. C.; & Zook, R. C., 1932	(d-7)
Resnick, 1934	(a-6)
Richardson, H. D., 1935	(f-2c)
Shanks, 1932	(e-4)
Silberman, et al., 1962	(d-5)
Small, Holtan, & Davis, 1967	(a-5e)
Stein, 1943	(f-2c)
Stone, C. A., 1931	(b-3)
Stone, C. A., 1937	(b-5)
Ulmer, 1939	(g-4)
Wong, 1970	(t-1b)
Zerbe, 1930	(d-8)
(Unsigned), 1935	(a-6)

[No research reports were assigned with a primary reference to this category.]

Other References

Brown, J. L., 1970	(d-5)
Habel, 1951	(d-1)
Johnson, A. W., 1936	(b-3)
Orleans, J. B., 1930	(b-3)

Calculus course (c-25)

Hubley, Martin F. and Maclay, Charles W. An Experiment in High School Calculus. *Math. Teach.* 63: 609-612; Nov. 1970. (ERIC Document No. EJ 029 473)

Almost all students who took a calculus course in either junior or senior year successfully qualified on the advanced placement test.

(I) use of calculus course. (D) advanced placement score.

a; ---; 2-s; 2 classes (37 students); 1.6; grs. 11, 12; 1 yr.; ---; ---.

Other Reference

Lackner, 1968	(a-4)

Cassidy, Walter F. The Commercial Mathematics Curriculum. Sch. Sci. Math. 41: 571-580; June 1941(a). (b-3, d-1)

Topics to be included in a commercial mathematics curriculum were compiled.

d; ---; ---; ---; ---; sec.; ---; ---; ---.

Cassidy, Walter F. The Course Content in Commercial Mathematics. Sch. R. 49: 436-444; June 1941(b). (a-2, b-3)

Over 100 basic mathematical items were "validated" for the commercial mathematics curriculum on the basis of the criterion of social utility.

d; ---; ---; ---; ---; sec.; ---; ---; ---.

Other References

Billig, 1944	(a-6)
Cassel & Ullom, 1962	(d-5)

__Other topics__ (c-30)

[No research reports were assigned with a primary reference to this category.]

Other Reference

Miller, H. R., 1969 (d-5)

Burton, E. D. An Experiment with a Different Textbook. *Sch. Sci. Math.* 39: 529-532; June 1939. (c-23)

The class using a textbook on integrated mathematics for geometry achieved a higher mean score but completed fewer proofs than a class using a regular textbook.

(I) type of textbook. (D) achievement.

a; ---; 2-s; 2 classes; 1.1, 1.4; gr. 10; 1 yr.; ---; ---.

Freeman, Ellen M. Textbook Trends in Plane Geometry. *Sch. R.* 40: 282-294; Apr. 1932. (a-1, c-23)

Establishing a concrete base for geometry, including more applications, and attending less to rigor but more to the development of logical thinking were among the trends observed in textbooks used from 1896 to 1932.

d; ---; ---; ---; 1.6; gr. 10; ---; ---; ---.

Habel, E. A. Does the Arithmetic in Algebra Textbooks Prepare for Trigonometry? *Sch. Sci. Math.* 51: 488-480; June 1951. (c-20, c-22, c-24)

Algebra textbooks contained few arithmetic exercises pertinent to preparation for trigonometry.

d; ---; ---; 27 textbooks; 1.1; sec.; ---; ---; ---.

Janes, Grace E. A Study of the Isolated Problems of Four Arithmetic Text Series. *Ed. Meth.* 16: 198-199; Jan. 1937. (a-5b)

The four textbooks presented from 339 to 883 problems, involving up to 6651 phases.

d; ---; ---; 4 textbooks; ---; grs. 3-8; ---; ---; ---.

Kilzer, L. R. and Thompson, Charles H. Status of Algebra and General Mathematics in the Ninth Grade. *Sch. R.* 43: 446-450; June 1935. (b-3, c-21, c-22)

General mathematics textbooks stressed arithmetic and geometry slightly more and algebra slightly less than did algebra textbooks.

d; ---; ---; ---; 1.6; gr. 9; ---; ---; ---.

Nelson, L. Doyal. Textbook Difficulty and Mathematics Achievement in Junior High School. Math. Teach. 58: 724-729; Dec. 1965. (d-9, e-2a)

1) In grade 7, no significant differences were found between high ability groups who used the SMSG text for college-capable students and those who used the text for slow learners, in 30 of 36 tests of the hypothesis.
2) In grade 9, no significant differences were found in 11 of 48 tests.
3) There was a tendency for high-ability, low-achieving students at both grade levels to perform better when using modified texts.

(I) use of low or high level SMSG texts with high ability students.
(D) achievement.

e; 3.1; 2-s, 3-m; 745 students (28 classes); 3.5, 6.2; grs. 7, 9;

1 yr.; norm, non-norm; 24 (3, 2, 3, 3, 3, 2, 3, 2, 3).

Novinger, Faith F. Distribution of Content in Twenty-Three Ninth-Grade Mathematics Textbooks for Non-Academic Pupils. Math. Teach. 35: 165-168; Apr. 1942. (c-21)

The amount of space devoted to various topics in each textbook was noted.

d; ---; ---; 23 textbooks; 1.1, 1.6; gr. 9; ---; ---; ---.

Olson, Ruth. The Changing Content of Ninth Grade Mathematics Texts. Math. Teach. 27: 307-314; Oct. 1934. (a-1, c-22)

Twelve topics were found to have received relatively constant emphasis in textbooks published between 1895 and 1929. Topics receiving increased or decreased emphasis were also noted.

d; ---; ---; 30 textbooks; 1.6; gr. 9; ---; ---; ---.

Sykes, Mabel. Some Criticisms of Recent Ninth Grade Algebra Texts. *Sch. Sci. Math.* 35: 153-160; Feb. 1935. (c-22)

Textbooks were analyzed in terms of placement and treatment of graphs, formulae, equations, provision for individual differences, use of tests, and system instruction in problem solving.

d; ---; ---; ---; ---; gr. 9; ---; ---; ---.

Williams, Robert L. The Selection of Mathematics Texts in the Junior High School. *Sch. Sci. Math.* 31: 284-291; Mar. 1931. (b-3)

The percentage of space allotted to various topics in three textbooks was analyzed and compared to objectives for junior high programs.

d; ---; ---; 3 textbooks; 1.6; grs. 7-9; ---; ---; ---.

---. *Curriculum and Teaching of Mathematics in the Higher Secondary Schools--An Analysis of Syllabuses.* 1967. (ERIC Document No. ED 023 584) (a-7, b-3)

Courses of study and textbooks were analyzed to determine objectives and arrangement of content.

d; ---; ---; 43 textbooks; ---; grs. K-12; ---; ---; ---.

Textbooks (d-1)

Other References

Austin, G. R., 1969	(a-4)
Butterweck, 1937	(a-1)
Cassel & Jerman, 1963	(a-4)
Cassidy, June 1941a	(c-26)
Cowley, 1934	(d-7)
Cowley, 1937	(c-7)
Duncan, D. C., 1934	(c-23)
Faison, 1951	(d-7)
Gibbs & Brgoch, 1964	(a-4)
Grossnickle, 1932	(c-3d)
Grove, 1950	(t-2c)
Gupta, 1969	(d-9)
Johnson, D. A., 1957	(d-7)
McKee, 1937	(a-1)
Pressey, S. L.; Pressey, L. C.; & Narragon, F. R., 1932	(d-7)
Pressey, S. L.; Pressey, L. C.; & Zook, R. C., 1932	(d-7)
Rendahl, 1930	(d-8)
Riedesel, 1957	(c-6)
Shaw, J. A., 1967	(d-7)
Smith, F., 1969	(d-7)
Urbancek, 1934	(c-22)
Wetherington, 1936	(b-5)
Williams, E. D. & Shuff, R. V., 1963	(d-9)

Adams, Imogen and Cole, Robert D. An Analysis of Algebra Workbooks. J. Ed. Res. 26: 116-131; Oct. 1932. (c-22)

It was found that no single book offered practice in all of the 109 different algebraic skills. There existed wide variation in emphasis on topics and in distribution of drill exercises.

d; ---; ---; 9 workbooks; ---; gr. 9; ---; ---; ---.

Durr, William K. The Use of Arithmetic Workbooks in Relation to Mental Abilities and Selected Achievement Levels. J. Ed. Res. 51: 561-571; Apr. 1958. (f-2b)

1) Students made greater gains in arithmetic vocabulary and fundamental operations after using workbooks.
2) Students who were above average in intelligence and achievement profited more.
3) Mean achievement gain favored workbooks in grades 4 and 5, but there were no significant differences in grades 6 through 8.

(I) use of workbooks. (D) achievement.

e; 3.18; 1-only; 102 students; 3.4; grs. 4-8; 26 wks.; norm;

27 (1, 3, 4, 5, 5, 2, 4, 2, 1).

Lach, Ivan John. Report of a Study on the Use of Programed Workbooks to Provide for Partially Individualized Mathematics Instruction in the Junior High. Math. Teach. 63: 512-515; Oct. 1970. (ERIC Document No. EJ 027 057) (d-5)

For students matched for sex and IQ, achievement and attitude were generally higher for those using programed workbooks than for those having teacher-led work on sample exercises.

(I) individual work in programmed workbooks or teacher-led work on sample exercises. (D) achievement; attitude.

e; 3.4; 2-m, 3-s; 2 classes; 1.4, 3.4; gr. 7; 6 mos.; norm;

27 (3, 2, 3, 4, 3, 3, 3, 3, 3).

Workbooks, other printed materials (d-2)

Stone, Charles A. The Workbook in Mathematics. *Sch. Sci. Math.* 35: 382-387; Apr. 1935.

When students used workbooks, test scores increased.

(I) use of workbook. (D) achievement.

a; ---; 2-s, 3-m; 8 classes; 1.3; grs. 8, 9; ---; non-norm; ---.

Other References

Bushnell, 1966	(b-3)
Kellett, 1966	(a-3)
Shanks, 1932	(e-4)
Stallard & Douglass, 1936	(a-5e)

Anderson, George R. Visual-Tactual Devices and Their Efficacy. Arith. Teach. 4: 196-201; Nov. 1957. (a-6, c-8, d-4)

Use of visual-tactual devices gave some assistance in learning and retention of a unit involving areas and volumes, but no statistically significant differences were found. Students of low mental ability do not seem to profit more than those of high mental ability from the use of devices. Students preferred mathematics over three other major subjects.

(I) use of kit of visual-tactual devices; IQ level. (D) achievement; retention; attitude.

e; 3.1 r; 2-a, 3-m; 541 students (18 classes); 1.5, 3.4; gr. 8;

8 wks. (retention, 12 wks.); norm, non-norm; 28 (2, 2, 3, 4, 4, 3,

3, 4, 3).

Gorman, F. H. What Laboratory Equipment for Elementary and High School Mathematics? Sch. Sci. Math. 43: 335-344; Apr. 1943. (a-4)

Lists of equipment useful in teaching mathematics at each level were compiled.

s; ---; ---; ---; 1.1; grs. K-12; ---; ---; ---.

Jamison, King W. An Experiment with a Variable Base Abacus. Arith. Teach. 11: 81-84; Feb. 1964. (c-15, f-2b)

1) No differences were found in the mean gains of the three groups which used a large abacus, individual abaci, or only a chalkboard.
2) No significant differences were found between girls and boys in the group where each student used an abacus.
3) No significant differences were found by IQ levels.

(I) abacus or no abacus; sex; IQ. (D) achievement.

e; 3.9; 1-only; 94 students (3 classes); 3.2, 3.4, 3.5; gr. 7;

5 days; non-norm; 27 (1, 2, 3, 4, 5, 3, 3, 2, 4).

Manipulative devices, games (d-3)

Johnson, J. T. The Use of a Ruler in Teaching Place Value in Numbers. *Math. Teach.* 45: 264-266; Feb. 1952. (c-2, c-8, c-14)

Students who were taught number concepts through the use of a ruler achieved a median score of 70 per cent on a short retention test.

(I) use of rulers. (D) retention score.

a; ---; 2-s; 120 students (4 classes); 1.3, 1.6, 1.8; grs. 6, 7;

2 days (retention, 1 wk.); non-norm; ---.

Longstaff, F. R.; *et al*. *Desk Calculators in the Mathematics Classroom*. June 1968. (ERIC Document No. ED 029 498) (a-6)

Results concerning use of calculators were equivocal: at best, attitudes of low achievers were more positive; at worst, they "cramped daily operations".

(I) use of calculator. (D) achievement; attitude.

a; ---; 1-only; ---; ---; grs. 5, 9; ---; ---; ---.

Other References

Anderson, G. R. & VanderMeer, A. W., 1954	(d-4)
Hess, 1955	(c-23)
Higgins, 1969	(a-6)
Higgins, 1970	(a-6)
Jones, T., 1968	(e-2a)
Kieren, 1969	(r-2)
Lewis, M., 1970	(e-5)
Ray, 1961	(a-4)
Schaaf, 1949	(r-2)
Schnur, 1969	(g-4)

Anderson, George R. and VanderMeer, Abram W. A Comparative Study of the Effectiveness of Lessons on the Slide Rule Presented Via Television and in Person. *Math. Teach.* 47: 323-327; May 1954. (d-3)

Teaching certain computational skills on the slide rule via television seemed about as effective as teaching it in person, but groups taught by television forgot more.

(I) use of television to present slide rule. (D) achievement.

e; 3.4 r; 2-m, 3-s; 5 classes (82 students); 1.4, 3.15; gr. 10;

6 wks.; non-norm; 30 (4, 3, 3, 4, 3, 4, 3, 3, 3).

Church, John G.; *et al.* *New Media for Improvement of Algebra Instruction.* June 1964. (ERIC Document No. ED 003 234) (c-22)

No significant increase in achievement resulted from use of visual and audiovisual materials.

(I) use of materials. (D) achievement.

a; ---; ---; 2 classes; ---; gr. 9; 1 yr.; non-norm; ---.

Devitt, Joseph J. *Intellectual Stimulation of Gifted Pupils in Small Secondary Schools Through Televised Instruction.* 1961. (ERIC Document No. ED 001 286) (e-3)

Instruction with television was concluded to be of value in teaching gifted students in rural schools.

(I) use of television with or without teacher-instruction.
(D) achievement.

a; ---; 1-only; 700 students; ---; grs. 10-12; ---; norm, non-norm;

---.

Ellis, June and Corum, Al. *Functions of the Calculator in the Mathematics Laboratory for Low Achievers.* 1969. (ERIC Document No. ED 040 847) (e-2a)

No significant gains were made by the group using calculators.

(I) use of calculators. (D) achievement; attitude; academic motivation.

Audio-visual devices (d-4)

a; ---; 2-s; 2 classes; 3.5; sec.; ---; ---; ---.

Hickey, Albert; *et al.* *Requirements for Graphic Teaching Machines.* Dec. 31, 1962. (ERIC Document No. ED 003 614) (c-22)

Graphics were reported to be more effective than symbols in acquiring algebra concepts.

(I) use of graphics or symbols. (D) achievement.

a; ---; ---; ---; ---; gr. 9; ---; ---; ---.

Jacobs, James N. and Bollenbacher, Joan. Teaching Seventh Grade Mathematics by Television. *Math. Teach.* 53: 543-547; Nov. 1960.

1) Significant interaction effects were noted between levels of student ability and methods of instruction. At the high level ability, performance was significantly in favor of the conventional classroom method of instruction; at the average ability level, performance was significantly in favor of the television method of instruction. At the below average ability level, no significant difference between methods of instruction was found.
2) There was no significant difference at any of the three ability levels among students taught by teachers who did and did not view television. There was no significant in-service teacher growth noted as a result of teachers viewing the televised lessons.

(I) instruction by television or conventional method; ability levels. (D) achievement.

e; 3.5; 2-s, 3-r; 27 classes; 3.5, 3.13; gr. 7; 1 yr.; norm;

17 (1, 2, 3, 2, 2, 1, 1, 3, 2).

Jacobs, James N.; Bollenbacher, Joan; and Keiffer, Mildred. Teaching Seventh-Grade Mathematics by Television to Homogeneously Grouped Below-Average Pupils. Math. Teach. 54: 551-555; Nov. 1961.

1) Televised and conventional instruction were equally effective in teaching computational skills to students initially below norm in achievement and grouped homogeneously. With respect to achievement in problem solving and concepts, a significant interaction between methods and teachers occurred resulting in two significant differences favoring television and three non-significant differences.
2) Television instruction seems more effective when students are grouped homogeneously rather than heterogeneously.

(I) instruction by television or traditional method. (D) achievement.

e; 2.8; 2-r, 3-r; 10 classes (524 students); 3.2, 3.3, 3.4; gr. 7;

1 yr.; norm; 13 (2, 2, 1, 1, 1, 1, 1, 2, 2).

Johnson, Donovan A. An Experimental Study of the Effectiveness of Films and Filmstrips in Teaching Geometry. J. Exp. Ed. 17: 363-372; Mar. 1949. (c-23)

Few significant differences were found among groups who used varying numbers of films and filmstrips. Retention was best for those classes using three films and three filmstrips for the circle unit.

(I) use of films and filmstrips or conventional instruction.
(D) achievement; retention.

e; 2.3 r; 2-r, 3-r; 27 classes; 3.2, 3.5, 3.19, 6.7; gr. 10;

(retention, 2 mos.); non-norm; 13 (3, 2, 1, 1, 1, 2, 1, 1, 1).

Johnson, Donovan A. Are Films and Filmstrips Effective in Teaching Geometry? Sch. Sci. Math. 50: 570-574; Oct. 1950. (c-23)

In few cases were significant differences found between groups using or not using films and filmstrips.

(I) use of films and filmstrips or conventional instruction only.
(D) achievement.

e; 2.3 r; 2-r, 3-r; 27 classes; 3.2, 3.4, 3.5; gr. 10; (retention, 2 mos.); non-norm; 17 (3, 2, 2, 1, 2, 2, 1, 2, 2).

Keough, John J. and Burke, Gerald W. Utilizing an Electronic Calculator to Facilitate Instruction in Mathematics in the 11th and 12th Grades. Final Report. July 1969. (ERIC Document No. ED 037 345)

The group using calculators achieved significantly more on a standardized test than did a group not using them.

(I) use of electronic calculators. (D) achievement.

e; 3.4; 2-s; 2 schools; 3.4; grs. 11, 12; ---; norm; ---.

Syer, Henry W. and Ingeneri, Peter J. Multi-Sensory Aids in Mathematics. Sch. Sci. Math. 49: 134-140; Feb. 1949.

Data on the availability and use of aids in Massachusetts schools were presented.

s; ---; 1-only; 150 schools; 1.6; sec.; ---; ---; ---.

Westley, Bruce H. and Jacobson, Harvey K. Instructional Television and Student Attitudes Toward Teacher, Course, and Medium. AV Comm. R. 11: 47-60; 1963. (a-6, c-22, d-9)

Students viewing a mathematics program had more favorable attitudes. Data for various concepts were presented.

s; ---; 2-s; 503 students; 1.1, 4.1; gr. 9; ---; ---; ---.

Westley, Bruce H. and Severin, Werner J. Viewer Location and Student Achievement. AV Comm. R. 13: 270-274; 1965. (c-22, d-9)

A significant positive correlation between distance from the television set (viewing a mathematics program) and achievement on a mathematics test was found: the farther the student sat from the set, the greater was his achievement.

r; ---; 1-only; 244 students (9 classes); 6.3, 6.4; gr. 9; ---; non-norm; ---.

Audio-visual devices (d-4)

Other References

Anderson, G. R., 1957	(d-3)
Beberman & Van Horn, 1960	(t-2b)
Cassel & Ullom, 1962	(d-5)
Eaton, 1938	(e-1b)
Miller, D. M.; *et al.*, 1966	(d-5)
Ross, V. R., 1930	(e-6)
Schaaf, 1949	(r-2)
Tiemens, 1962	(g-5)

Programmed instruction (d-5)

Ashbaugh, W. H. Effect on Achievement of Written Responses to Programmed Learning Material for Students of Differing Academic Ability. Psychol. Reports 14: 780-782; June 1964.

No significant differences were found between students answering covertly or overtly on a modern mathematics program.

(I) type of response. (D) achievement.

e; 3.4; 1-only; 358 students; 3.5, 6.1; jr. high; ---; ---; ---.

Bassler, Otto C. Comparison of Two Teaching Techniques in Elementary School Mathematics. July 1968. (ERIC Document No. ED 023 595) (c-9, c-15)

Groups taught operations with integers, modulus arithmetic, or vector arithmetic achieved most when texts used a linear program format with a high level of guidance.

(I) type of format. (D) achievement.

e; 3.4; 2-s, 3-r; ---; ---; grs. 4, 6, 8; ---; ---; ---.

Beane, D. G. A Comparison of Linear and Branching Techniques of Programed Instruction in Plane Geometry. J. Ed. Res. 58: 319-326; Mar. 1965. (c-23)

No significant differences were found between groups using different types of programs in varied order.

(I) branching or linear program; order of use; ability level.
(D) achievement.

e; 3.16; 1-only; 48 students; ---; gr. 10; 2 wks.; ---; ---.

Biddle, John C. Effectiveness of Two Methods of Instruction of High School Geometry on Achievement and Retention: A Two and One-Half Year Study. Sch. Sci. Math. 67: 689-694; Nov. 1967. (c-23)

No significant differences were found between groups having programmed or conventional instruction, except on the posttest after 12 months for students who had advanced algebra, where the conventional group had higher scores.

(I) programmed or conventional instruction. (D) achievement; retention.

e; 3.1 r; 2-s, 3-m; 128 students; 1.4, 1.6, 3.4; gr. 10; 1 yr.

(retention, 12 and 18 mos.); norm; 23 (2, 2, 3, 3, 3, 3, 2, 3, 2).

Briggs, Leslie J. and Campbell, Vincent M. Adjusting Self-Instruction Programs to Individual Differences--Studies of Cueing, Responding and Bypassing. July 1961. (ERIC Document No. ED 003 661)

Bypassing appeared to be a potentially versatile technique for adapting programmed instruction in mathematics to individual differences.

a; ---; ---; ---; ---; grs. 8-10; ---; norm; ---.

Brinkmann, Erwin H. Programed Instruction as a Technique for Improving Spatial Visualization. J. Appl. Psychol. 50: 179-184; Apr. 1966. (c-23)

A group taught geometric topics such as point, set, line, ray, plane figure, and solids by the use of estimations of discrimination, identification, relationship and orientation with programmed materials achieved significantly higher scores on a Geometry Inventory and on a Space Relations test than those who continued regular mathematics classes. Students who felt that teachers could teach better than a program more consistently scored below the median.

(I) programmed materials plus tests or tests only. (D) spatial relations scores; achievement; attitude; error rate.

e; 3.1; 2-s, 3-m; 50 students (2 classes); 1.1, 1.4, 1.5, 1.6, 3.4;

gr. 8; 3 wks.; non-norm; 34 (3, 4, 3, 4, 4, 5, 4, 3, 4).

Brown, Jerry L. Effects of Logical and Scrambled Sequences in Mathematical Materials on Learning with Programmed Instruction Materials. J. Ed. Psychol. 61: 41-45; Feb. 1970. (ERIC Document No. EJ 016 147) (b-3, c-24)

The logical-sequence group scored significantly faster and better than the scrambled-sequence group on the criterion test of number series (in trigonometry), but no significant differences were found on tests of on-route tasks or attitude.

Programmed instruction (d-5)

(I) two sequence conditions; IQ. (D) time; errors; achievement; attitude.

e; 2.8; 2-s, 3-r; 67 students (2 classes); 3.2, 3.4; grs. 10, 11;

2 days; non-norm; 20 (4, 2, 2, 2, 3, 2, 2, 2, 1).

Brown, O. Robert, Jr. Achievement of Students from Groups Instructed by Programed Materials, Classroom Teacher, or Both. Comparative Studies of Principles for Programming Mathematics in Automated Instruction. Technical Report No. 12. July 1964. (ERIC Document No. ED 020 675)

Groups taught conventionally or with programmed materials followed by conventional instruction achieved significantly higher than a group using programs only.

(I) use of programmed materials. (D) achievement.

e; 3.3; 2-s, 3-m; 20 classes (390 students); ---; gr. 9; ---; ---;

---.

Carpenter, Paul W. and Fillmer, H. T. A Comparison of Teaching Machines and Programed Texts in the Teaching of Algebra I. J. Ed. Res. 58: 218-221; Jan. 1965. (c-22)

No significant differences in achievement were found between groups studying a unit in algebra using programmed texts or teaching machines.

(I) use of programmed text or teaching machine. (D) achievement.

e; 2.4; 2-s, 3-r; 30 students; 1.4, 1.10, 3.4; gr. 9; 7 wks.; norm,

non-norm; 26 (4, 3, 3, 3, 3, 3, 2, 2, 3).

Cassel, Russell N. and Ullom, William L. A Preliminary Evaluation of Programmed Instruction with Students of High Ability. Psychol. Reports 10: 223-228; Feb. 1962. (c-26, d-4, d-6b)

Students using a program on computer mathematics presented on a teaching machine gained significantly more than a group merely given the test on two successive days. Attitudes toward the device were favorable.

(I) use of teaching machine. (D) achievement; attitude.

e; 1.3; 2-s, 3-r; 64 students; 1.6, 3.2, 3.3; grs. 9, 12; ---;

non-norm; 24 (3, 3, 3, 3, 2, 3, 2, 3, 2).

Coulson, John E. Research with a Program on Geometric Inequalities. June 26, 1964. (ERIC Document No. ED 003 208) (c-23)

A program using an inductive approach was developed and revised; empirical records were kept and used to derive general principles of program design.

a; ---; ---; ---; ---; gr. 10; ---; ---; ---.

Coulson, John E. The Teacher's Role in Classes Using Self-Study Materials. May 6, 1967. (ERIC Document No. ED 015 169) (c-23)

No differences in achievement with programmed materials on geometry were found when teachers actively augmented instruction or merely monitored.

(I) active or monitorial teacher role with programmed materials.
(D) achievement.

a; ---; ---; ---; ---; gr. 10; ---; ---; ---.

Coulson, John E.; et al. Nonprogram Variables in the Application of Programed Instruction. July 21, 1965. (ERIC Document No. ED 003 217) (c-23, d-6a)

No difference in achievement resulted when programs were used with various types of student and teacher augmentation.

(I) type of program-use. (D) achievement.

a; ---; 1-only; 4 classes (104 students); ---; gr. 10; ---; ---;

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Programmed instruction (d-5)

Davis, Keith G. and Banning, James H. The Role of Personality and Attitude Variables in Programmed Instruction. Final Report. Apr. 1968. (ERIC Document No. ED 022 364)

Attitude scores were found to be the best predictors of success with a programmed mathematics course.

r; ---; 1-only; 97 students; 6.1, 6.3; grs. 10, 11; ---; ---; ---.

Dessart, Donald J. A Study in Programed Learning. Sch. Sci. Math. 62: 513-520; Oct. 1962. (c-17)

All groups evidenced "satisfactory" understanding of the concepts of convergence and divergence. When time was equated, there were no significant differences for teacher-taught, branch, or linear groups. Teacher-taught groups achieved significantly more than some groups using programs, but took longer.

(I) linear or branched programs, with or without teacher aid.
(D) achievement.

e; 2.16; 2-s, 3-r; 80 students; 1.4, 3.2, 3.5, 3.20; gr. 8; 1 wk.;

non-norm; 30 (3, 4, 3, 4, 3, 4, 2, 4, 3).

Devine, Donald F. Student Attitudes and Achievement: A Comparison Between the Effects of Programmed Instruction and Conventional Classroom Approach in Teaching Algebra I. Math. Teach. 61: 296-301; Mar. 1968. (a-6, c-22)

Regular instruction was found to be more effective when teachers were average to above-average, while programmed materials were more effective than an inexperienced or below-average teacher.

(I) conventional or programmed instruction. (D) achievement; attitude.

e; 2.4; 2-r, 3-r; 107 students; 1.4, 3.2, 3.3; gr. 9; 1 yr.; norm;

20 (3, 2, 3, 2, 2, 2, 2, 2, 2).

Easterday, Kenneth and Easterday, Helen. Ninth-Grade Algebra, Programmed Instruction, and Sex Differences: An Experiment. Math. Teach. 61: 302-307; Mar. 1968. (c-21, e-6)

Significant differences were found favoring those using programmed instruction. Programmed materials appeared to be especially effective for lower achievers and for boys.

(I) programmed or traditional instruction. (D) achievement.

a; ---; 2-s, 3-s; 2 classes (57 students); 1.1, 3.4; gr. 9; 1 yr.;

norm, non-norm; ---.

Eigen, Lewis D. A Comparison of Three Modes of Presenting a Programmed Instruction Sequence. J. Ed. Res. 55: 453-460; June/July 1962. (c-2)

There were no significant differences in learning a unit on numbers and numerals by teaching machine, vertical text, or horizontal text.

(I) use of teaching machine, horizontal text, or vertical text.
(D) achievement.

e; 2.12; 2-s, 3-r; 77 students; 3.2, 6.3; gr. 8; (retention, 4 wks.);

non-norm; 22 (4, 2, 2, 1, 2, 4, 3, 2, 2).

Feldhusen, John F.; Ramharter, Hazel; and Birt, Andrew T. The Teacher vs. Programed Learning. Wisc. J. Ed. 95: 8-10; Nov. 1962.

1) No significant differences were found whether groups were taught by programmed instruction or by a teacher.
2) More responses on the attitude questions favored programmed instruction.

(I) programmed or teacher instruction. (D) achievement; attitude.

e; 2.6; 2-r, 3-m; 26 students (1 class); 1.4; gr. 7; 14 wks.; norm;

28 (4, 3, 3, 4, 4, 2, 3, 2, 3).

Programmed instruction (d-5)

Glaser, Robert; Reynolds, James H.; and Fullick, Margaret G. Studies of the Use of Programmed Instruction in the Intact Classroom. Psychol. in Sch. 3: 318-333; Oct. 1966. (c-3, c-8, c-21)

Wide variations in rate of learning were found in three experiments using programs. Data and discussion on many variables were presented.

(I) order of use of program; type of program; effect of teacher help; review; ability. (D) achievement; time; retention.

e; 3.4 r; 2-s; 121 students (1), 173 students (4), 2 groups (9);

1.1, 1.4, 1.6, 3.4, 6.4; grs. 1, 4, 9; 8-25 days (1); norm, non-norm; ---.

Hountras, Peter T. and Belcastro, Frank P. A Comparison of Four Techniques of Programming Algebra. Sci. Ed. 47: 388-393; Oct. 1963. (a-4, c-22)

The verbal-deductive technique was found to be superior to the non-verbal inductive, verbal inductive, and non-verbal deductive techniques.

(I) four programming techniques. (D) achievement.

e; 2.4; 2-m, 3-r; 454 students; 1.4, 3.2, 3.4, 3.20; gr. 8; 3 days;

---; 17 (2, 2, 2, 2, 1, 3, 2, 2, 1).

Jordy, James L. A Comparative Study of Methods of Teaching Plane Geometry. Math. Teach. 57: 472-478; Nov. 1964. (c-23)

Use of programmed materials appeared to be as effective as a lecture-recitation method.

(I) type of instruction. (D) achievement.

a; ---; ---; 53 students; 1.3, 1.4, 6.4; grs. 11, 12; ---; norm;

---.

Lucas, James S. A Two Year Study Comparing the Achievement Effect of Eighth Grade Programmed Algebra Instruction to Conventional Textbook Algebra I Instruction. Calif. J. Ed. Res. 18: 179-183; Sept. 1967. (a-4, c-22)

No significant differences in achievement were found at the end of two years between students who had programmed algebra instruction or regular instruction in grade 8.

(I) programmed instruction or regular instruction. (D) achievement.

e; 3.7 r; 2-s, 3-r; 60 students; 1.10, 3.4; gr. 8; 2 yrs.; norm;

31 (4, 3, 4, 4, 3, 3, 4, 3, 3).

McGarvey, Paul. Programmed Instruction in Ninth-Grade Algebra. Math. Teach. 55: 576-577; Nov. 1962. (c-22)

A programmed algebra course resulted in increased scores for most students. Another class, using a textbook, also achieved higher scores.

(I) use of program or textbook. (D) achievement.

a; ---; 1-only; 39 students; 1.3, 1.4, 1.10; gr. 9; 6 wks.; norm;

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Meadowcroft, Bruce A. Comparison of Two Methods of Using Programmed Learning. Arith. Teach. 12: 422-425; Oct. 1965.

There was no significant difference in achievement for accelerated groups who had little programmed instruction with teacher instruction (individual) and groups in which teacher instruction preceded and followed programmed learning (restrictive). Students in the first group had significantly better attitudes toward both subject and method.

(I) instruction by teacher with or preceding and following programmed learning; ability levels. (D) achievement; attitude.

e; 2.4; 2-s, 3-r; 303 students; 3.4; gr. 7; 1 yr.; norm, non-norm;

19 (2, 2, 2, 2, 1, 2, 3, 3, 2).

Programmed instruction (d-5)

Meadowcroft, Bruce A. The Effects on Conventionally Taught Eighth-Grade Math Following Seventh-Grade Programmed Math. Arith. Teach. 12: 614-616; Dec. 1965. (a-4, g-2)

Groups which had been taught with programmed instruction were not significantly different from groups taught by conventional methods, either immediately or one year later.

(I) use of programmed materials. (D) retention.

f; ---; 1-only; 249 students; 3.4; grs. 6-8; 2 yrs.; norm; ---.

Miller, Donald M.; et al. Multimedia Instructional Programs in Mathematics--Demonstration and Experimentation. The Assimilation of New Media in the Instructional Program of a Rural School. Final Report. June 1966. (ERIC Document No. ED 028 637) (d-4)

Programmed instruction was successfully integrated with a multimedia approach to mathematics instruction.

(I) use of programmed instruction. (D) achievement.

a; ---; ---; ---; ---; gr. 9; ---; ---; ---.

Miller, Herbert R. Sequencing and Prior Information in Linear Programed Instruction. AV Comm. R. 17: 63-76; Spring 1969. (ERIC Document No. EJ 002 703) (c-30)

No significant differences were found on programs with logical or non-logical sequences in grade 8, but twelfth graders performed significantly better on a non-logical program.

(I) type of program. (D) achievement; retention.

e; 2.8 r; 2-s, 3-r; 224 students; 1.4, 2.6, 3.2; grs. 8, 12; 1 wk.

(retention, 1 mo.); non-norm; 17 (3, 2, 2, 2, 2, 2, 2, 1, 1).

Morrow, Thomas J. Programmed Mathematics, Des Moines High School. Nov. 1965. (ERIC Document No. ED 020 064) (e-2)

Use of programs provided for little interaction between teachers and students, and it was concluded that they should supplement rather than replace standard instructional materials.

(I) use of programmed materials. (D) amount of interaction.

a; ---; 1-only; 46 students; ---; sec.; 2 yrs.; ---; ---.

Niedermeyer, F. C.; Brown, J.; and Sulzen, R. Learning and Varying Sequences of Ninth-Grade Mathematics Materials. J. Exp. Ed. 37: 61-66; Spring 1969. (ERIC Document No. EJ 006 374) (b-3, g-4)

Program error rates differed significantly in favor of logical sequencing, but instructional time differences did not. No significant differences in achievement were found between the three types of sequences, but those using the logical sequence had more positive attitudes.

(I) logical, scrambled, or reverse order sequences. (D) achievement; number of errors; time; transfer; attitude.

e; 2.8; 2-s, 3-r; 64 students; 1.4, 2.6, 3.2, 4.4; gr. 9; 2 days;

non-norm; 20 (3, 2, 2, 2, 2, 3, 2, 2, 2).

Price, James E. Automated Teaching Programs with Mentally Retarded Students. Am. J. Ment. Def. 68: 69-72; July 1963. (c-3, e-2c)

The multiple-choice program was more effective than a constructed-answer program or conventional instruction.

(I) programmed or conventional instruction. (D) achievement.

e; 3.12; 2-s, 3-s; 33 students; 3.4; ages 11-24; 1 yr.; non-norm;

24 (3, 2, 2, 3, 2, 3, 3, 3, 3).

Randolph, Paul H. An Experiment in Programmed Instruction in Junior High School. Math. Teach. 57: 160-162; Mar. 1964. (c-12)

Students who used a programmed text on sets, relations, and functions achieved significantly.

(I) use of programmed text. (D) achievement.

a; ---; 2-s, 3-s; ---; 1.4, 1.5, 1.10, 3.4; gr. 7; 9 wks.; norm;

---.

Programmed instruction (d-5)

Raymond, Roger A. Teaching Algebra to Ninth and Tenth Grade Pupils with the Use of Programmed Materials and Teaching Machines. Oct. 1963, Oct. 1964. (ERIC Document No. ED 023 311; ED 023 312) (c-22)

Although both groups made significant gains, neither conventional nor programmed instruction was clearly superior to the other. Use of programmed materials for specific purposes was recommended.

(I) programmed or conventional instruction. (D) achievement.

e; 3.4; 1-only; ---; ---; grs. 9, 10; ---; norm; ---.

Silberman, Harry; et al. Development and Evaluation of Self-Instructional Materials for Underachieving and Overachieving Students. July 1962. (ERIC Document No. ED 003 177) (c-23, e-2a, e-3a)

Differences between types of programs were not evident; it was concluded that the dimensions for effectively developing programs have not been identified.

(I) rote or conceptual form of program; achievement level.
(D) achievement.

a; ---; 1-only; 27 classes (250 students); ---; gr. 10; ---; ---;

---.

Sjogren, Douglas D. Programmed Materials in High School Correspondence Courses. 1964. (ERIC Document No. ED 003 282)

Algebra students who used programmed materials completed the course more quickly than those using a program-supplemented or a correspondence course; achievement was not different.

(I) type of course. (D) achievement; time.

a; ---; 1-only; 186 students; ---; grs. 8, 9; ---; ---; ---.

Sneider, Sister Mary Joetta. Achievement and Programmed Learning. Math. Teach. 61: 162-164; Feb. 1968.

Students having lecture-demonstration instruction achieved significantly more than those using programmed instruction.

(I) programmed or regular instruction. (D) achievement.

e; 2.3; 2-s, 3-m; 42 students; 1.5, 1.6, 3.4; gr. 9; ---; non-norm; 28 (3, 3, 3, 3, 3, 4, 3, 3, 3).

---. *Programmed Mathematics, Dora High School*. Nov. 1965. (ERIC Document No. ED 026 184) (c-22)

Students who used a mathematics program had a "gain ratio" of .63 from pre- to posttest.

(I) use of programmed materials. (D) achievement.

a; ---; ---; ---; ---; gr. 9; ---; ---; ---.

Other References

Archer & Woodlen, 1967	(a-4)
Belcastro, Jan. 1966	(a-4)
Belcastro, Spring 1966	(a-4)
Bivens, 1964	(g-6b)
Blackman & Capobianco, 1965	(e-2c)
Briggs & Angell, 1964	(r-2)
Brown, O. R., Jr., 1967	(d-9)
Calvin & Hanley, 1962	(d-7)
Campbell, 1964	(a-4)
Campbell, *et al.*, 1963	(g-5)
D'Augustine, 1966	(c-11)
Della-Piana, *et al.*, 1965	(a-4)
Flynn, 1969	(e-5)
Gibbs & Brgoch, 1964	(a-4)
Hagan, 1967	(b-6)
Henderson & Rollins, 1967	(a-4)
Holtan, 1964	(g-5)
Jones, T., 1968	(e-2a)
Kersh, 1962	(a-4)
King, 1970	(r-2)
Kinzer & Worcester, 1965	(g-6a)
Lach, 1970	(d-2)
Lackner, 1967	(r-2)
Lackner, 1968	(a-4)
Meconi, Fall 1967	(a-4)
Paulson, 1964	(g-6b)
Rosen & Stolurow, 1964	(g-4)
Scandura & Durnin, 1968	(g-1)
Shaver & White, 1966	(e-5)
Zoll, 1969	(r-2)

Computer-aided instruction (d-6)

Pressey, L. C. and Moore, W. S. The Growth of Mathematical Vocabulary from the Third Grade Through High School. Sch. R. 40: 449-454; June 1932.

Results of a vocabulary test are cited to show that 89 words were never mastered by more than 50 per cent of the students at any level, and only 36 words were ever mastered by as many as 95 per cent. The median master of 106 arithmetic words is 16 at grade 3, 31 at grade 4, 42 at grade 5, 59 at grade 6, 71 at grade 7, and then above 80 in the upper grades.

s; ---; 1-only; approx. 5000 students; 1.3, 1.6; grs. 3-12; ---;

non-norm; ---.

Crawford, Alan N. A Pilot Study of Computer-Assisted Drill and Practice in Seventh Grade Remedial Mathematics. Calif. J. Ed. Res. 21: 170-181; Sept. 1970. (ERIC Document No. EJ 027 030) (a-5a, e-2)

Students who had 3-15 minutes of extra computational practice per day gained significantly from pre- to posttest; however, scores were not significantly different from those of a group with no extra practice.

(I) use of CAI program. (D) achievement; attitude.

a; ---; 2-s, 3-s; 2 classes (30 students); 3.4, 4.6; gr. 7; 8 wks.;

norm, non-norm; ---.

Other References

Coulson, *et al.*, 1965	(d-5)
Gay, 1969	(g-2)
Hatfield, 1969	(r-2)
Love, 1969	(e-4)

Non-tutorial (d-6b)

Buchman, Aaron L. The Use of Calculators and Computers in Mathematics Instruction in New York State High Schools. Sch. Sci. Math. 69: 385-392; May 1969. (ERIC Document No. EJ 003 641)

Only 13 per cent of the schools reported (1967-68) having calculators in the mathematics department, with 2 per cent of these having computer features. Five per cent of the classes had computer facilities which were used by mathematics classes.

s; ---; 2-s; 1185 schools; 1.1, 1.6; grs. 7-12; ---; ---; ---.

Richardson, Jesse O. Teaching Mathematics Through the Use of a Time-Shared Computer. Mar. 1968. (ERIC Document No. ED 023 606)

Programming languages were effectively taught to elementary and secondary students.

a; ---; ---; ---; ---; grs. 6-12; ---; ---; ---.

Other References

Cassel & Ullom, 1962	(d-5)
Hatfield, 1969	(r-2)
Werner, 1970	(b-3)

Brotherton, D. A.; Read, J. M.; and Pratt, K. C. Indeterminate Number Concepts: II. Application by Children to Determinate Number Groups. J. Genet. Psychol. 73: 209-236; 1948. (c-8)

The indeterminate (use of few, some, etc.) number judgments of children varied according to the nature of the thing being judged. Sex differences were negligible. Greater variability was found at younger ages.

s; ---; 2-s; 336 students; 1.6, 3.15; grs. 2, 3, 6, 7, 10, 11; ---;

---; ---.

Buckingham, Guy E. The Relationship Between Vocabulary and Ability in First Year Algebra. Math. Teach. 30: 76-79; Feb. 1937. (c-22)

Relationships of .25 to .40 were found between vocabulary knowledge and ability to solve various types of algebra problems and statements.

r; ---; 1-only; 139 students; 1.1, 1.6, 6.4; gr. 9; ---; norm,

non-norm; ---.

Buckingham, Guy E. The Relationship Between Silent Reading Ability and First Year Algebra Ability. Math. Teach. 30: 130-132; Mar. 1937. (c-22)

Correlations between algebra scores and different types of reading ability were positive and relatively low.

r; ---; 1-only; 105 students; 1.4, 1.6, 6.4; gr. 9; ---; norm; ---.

Call, Russell J. and Wiggin, Neal A. Reading and Mathematics. Math. Teach. 59: 149-157; Feb. 1966. (a-5b, c-22)

The group taught "to get the meaning from the words and translate it into mathematical symbols" (in a unit on linear equations and word problems) scored higher than a group not given special reading instruction.

(I) reading instruction. (D) achievement.

a; ---; 2-s, 3-m; 2 classes (44 students); 1.1, 1.4; Algebra II;

10 days; non-norm; ---.

Readability and vocabulary (d-7)

Calvin, Allen D. and Hanley, Charles. Exposure to Programmed Learning Material and Reading Comprehension. Psychol. Reports 10: 538; Apr. 1962. (c-22, c-23, d-5)

Students using programmed material for geometry were significantly better than those having conventional instruction in speed of reading comprehension, but not level of comprehension. No significant differences were found between Algebra I or II groups.

(I) use of programmed materials for mathematics. (D) reading achievement.

e; 3.8; 1-only; 564 students; 3.5; grs. 9-11; 1 yr.; norm;

31 (4, 4, 4, 3, 4, 3, 3, 2, 4).

Clark, Mildred I. The Effect of Remedial Work in Reading Comprehension Upon Algebraic Achievement. Math. Teach. 32: 65-67; Feb. 1939. (c-22)

Students having reading instruction achieved higher reading and algebra scores than those not having special instruction.

(I) remedial instruction in reading comprehension. (D) achievement in algebra.

a; ---; 2-s, 3-m; ---; 1.4, 1.5, 1.6, 6.4; gr. 9; 1 yr.; norm; ---.

Cowley, Elizabeth B. Technical Vocabularies for Plane and Solid Geometry. J. Ed. Res. 27: 344-354; Jan. 1934. (c-23, d-1)

Three studies on geometry vocabularies were analyzed; six books were examined; and a questionnaire was sent. From the findings a basic and a secondary vocabulary were constructed.

d; ---; ---; 3000 students; ---; gr. 10; ---; ---; ---.

Drake, Richard M. The Effect of Teaching the Vocabulary of Algebra. J. Ed. Res. 33: 601-610; Apr. 1940. (c-22)

The study of vocabulary in algebra improved achievement.

(I) teaching vocabulary. (D) achievement.

e; 3.1; 2-s, 3-m; 410 students (6 schools); 1.4, 3.4; gr. 9; 3-40 wks.; norm, non-norm; 29 (3, 3, 4, 4, 3, 3, 3, 3, 3).

Dresher, Richard. Training in Mathematics Vocabulary. Ed. Res. B. 13: 201-204; Nov. 14, 1934. (a-5b)

There was comparatively little gain in knowledge of mathematical vocabulary with usual teaching procedures, but definite and consistent gain in both vocabulary and ability to solve problems as a result of specific training in mathematical vocabulary.

(I) training in vocabulary. (D) achievement.

e; 3.4; 1-only; 500 students; 1.3, 1.5; grs. 7-9; 1 semester; non-norm; 37 (3, 4, 4, 5, 5, 4, 4, 4, 4).

Eagle, Edwin. The Relationship of Certain Reading Abilities to Success in Mathematics. Math. Teach. 41: 175-179; Apr. 1948. (d-8)

Reading comprehension was found to be associated with success in mathematics, but largely associated with mental age. The relationship of reading speed was variable; for students with low MA and low reading comprehension, slower readers tended to be poorer in mathematics, while for those with average MA and comprehension, slow readers tended to excel in mathematics. Mathematics vocabulary, interpreting graphs, and formulas, and data organization were important to mathematics success. Use of materials and models was suggested.

r; ---; ---; 317 students; 6.4; gr. 9; ---; norm, non-norm; ---.

Faison, Edmund W. J. Readability of Children's Textbooks. J. Ed. Psychol. 42: 43-51; Jan. 1951. (d-1)

In a ranking of books for each subject area, mathematics books were ranked first for reading ease and second for interest. An attempt to personalize the contents was apparent only in the mathematics books.

d; ---; ---; 38 textbooks; 1.9; grs. 5-8; ---; ---; ---.

Readability and vocabulary (d-7)

Finck, Edgar M. Relation of Ability in Reading to Success in Other Subjects. El. Sch. J. 36: 260-267; Dec. 1935. (e-2d)

Tutoring in reading resulted in achievement gains in other subjects; in arithmetic, the average gain was greater for reasoning than for computation.

(I) tutoring in reading. (D) achievement in arithmetic.

e; 2.2; 2-m, 3-s; 42 students; 1.5; grs. 1-8 (ages 9-16); 5 mos.;

norm; 33 (3, 3, 4, 5, 4, 3, 5, 3, 3).

Gabel, Otto J. The Effect of Definite Versus Indefinite Quantitative Terms Upon the Comprehension and Retention of Social Studies Material. J. Exp. Ed. 9: 177-186; Dec. 1940. (d-8)

A significant difference was found favoring the test form on which quantitative data was presented definitely.

(I) two types of tests. (D) achievement; retention; transfer.

e; 2.8 r; 2-s, 3-r; 1627 students; 1.4, 1.6, 3.2, 3.3, 6.4; grs.

6, 8, 10, 12; 1 testing; non-norm; 30 (3, 4, 4, 3, 3, 4, 3, 3, 3).

Hater, Mary Ann and Kane, Robert B. The Cloze Procedure as a Measure of the Reading Comprehensibility and Difficulty of Mathematical English. 1970. (ERIC Document No. ED 040 881)

Cloze tests were found to be highly reliable measures and valid predictors of the reading comprehensibility of mathematical English passages.

d; ---; ---; ---; ---; grs. 7-12; ---; ---; ---.

Jackson, Nelson A. Vocabulary in Beginning Algebra. Sch. Sci. Math. 35: 690-694; Oct. 1935. (c-22)

On a series of tests, little improvement in understanding of vocabulary was noted.

(I) emphasis on vocabulary. (D) achievement.

a; ---; 1-only; 97 boys; 1.6; gr. 9; 15 wks.; non-norm; ---.

Johnson, Donovan A. The Readability of Mathematics Books. Math. Teach. 50: 105-110; Feb. 1957. (d-1)

The analyzed seventh and eighth grade texts were found to require a high level of reading skill, algebra books were of approximately the right grade level, while geometry books had readability level at or below the grade for which they were written.

d; ---; ---; 18 books; 1.3; grs. 7-10; ---; ---; ---.

Johnson, Harry C. The Effect of Instruction in Mathematical Vocabulary Upon Problem Solving in Arithmetic. J. Ed. Res. 38: 97-100; Oct. 1944. (a-5b, g-1)

1) Groups specifically taught mathematical vocabulary achieved significantly higher scores on each of three vocabulary tests than groups receiving regular instruction.
2) No evidence was found that this training transfers to other words.
3) Groups taught vocabulary achieved significantly higher scores on two of three problems tests than groups receiving regular instruction. It seemed possible that more regular instruction was devoted to vocabulary in the case of the third test.
4) The superiority of the experimental group was maintained for students at practically all levels of mental ability and initial status, and through the retention period.

(I) specific instruction on vocabulary or regular practices.
(D) achievement; retention.

e; 3.1 r; 2-s, 3-m; 898 students (28 classes); 1.4, 3.3, 3.4, 3.18,

3.19, 6.7; gr. 7; 14 wks. (retention, 3 mos.); norm, non-norm;

21 (2, 2, 2, 3, 2, 3, 2, 3, 2).

McCallister, James M. Determining the Types of Reading in Studying Content Subjects. Sch. R. 40: 115-123; Feb. 1932. (d-8)

A list of reading activities employed in a mathematics class was compiled.

s; ---; 1-only; 1 class; ---; gr. 7; ---; ---; ---.

Readability and vocabulary (d-7)

Pitts, Raymond J. Relationship Between Functional Competence in Mathematics and Reading Grade Levels, Mental Ability, and Age. J. Ed. Psychol. 43: 486-492; Dec. 1952. (f-2)

A positive relationship was found between mathematical competence and both reading level (.53) and MA (.46) for Negro girls.

r; ---; 2-s; 210 girls (17 schools); 6.4; gr. 11; ---; norm; ---.

Posamentier, Alfred. The Effect of Reading Ability on Performance on the Orleans Geometry Prognosis Test. Grad. Res. in Ed. & Related Disciplines 2: 184; Nov. 1966. (c-23, f-2c)

Students who read well performed better on the prognosis test than those who read poorly, regardless of mathematical ability.

r; ---; 2-s, 3-m; 158 students; 6.4; grs. 9, 10; ---; norm; ---.

Pressey, S. L.; Pressey, L. C.; and Narragon, F. R. Essential Vocabulary in Algebra. Sch. Sci. Math. 32: 672-674; June 1932. (c-22, d-1)

In algebra textbooks, 382 different technical words were found. Of these, 86 occurred frequently, and 52 were considered essential.

d; ---; ---; ---; ---; gr. 9; ---; ---; ---.

Pressey, S. L.; Pressey, L. C.; and Zook, R. C. The Essential Technical Vocabulary of Plane Geometry. Sch. Sci. Math. 32: 487-489; May 1932. (c-23, d-1)

Almost 1,000 different technical words were found in textbooks. Of 169 occurring at least ten times, 77 were considered essential in geometry.

d; ---; ---; ---; ---; gr. 10; ---; ---; ---.

Russell, David H. and Holmes, F. Melville. An Experimental Comparison of Algebraic Reading Practice and the Solving of Additional Verbal Problems in Tenth Grade Algebra. Math. Teach. 34: 347-352; Dec. 1941. (a-5b, c-22)

The group which practiced reading algebraic materials gained more in reading but was not different from the problems-only group in attaining correct answers for algebra problems.

(I) problem solving with or without reading exercises.
(D) achievement.

e; 3.1; 2-s, 3-m; 4 classes (99 students); 1.4, 1.5, 3.15; gr. 10;

24 days; norm, non-norm; 22 (3, 2, 2, 2, 3, 2, 3, 3, 2).

Semmelmeyer, Madeline. Extensional Methods in Dealing with Abstractions in Reading. El. Sch. J. 50: 28-36; Sept. 1949. (a-2, a-5b)

The kinds of experiences which help develop greater understanding of measurement terms were presented.

(I) developing word meanings. (D) achievement.

a; ---; 1-only; ---; ---; gr. 8; ---; norm; ---.

Shaw, Judith A. Reading Problems in Mathematics Texts. Aug. 1967. (ERIC Document No. ED 016 587) (d-1)

The greatest number of words were introduced at grade 4. There was great internal variation of reading level in all texts, with a significant increase in expository and story problem reading in the fourth grade. In grade 7, high-ability texts had 5th to 6th grade reading level; low-ability texts had 7th grade reading level; and middle-ability texts had 9th to 10th grade reading level.

d; ---; ---; ---; ---; grs. 1-8; ---; ---; ---.

Smith, Frank. The Readability of Junior High School Mathematics Textbooks. Math. Teach. 62: 289-291; Apr. 1969. (ERIC Document No. EJ 003 163) (d-1)

Only six of eleven seventh grade textbooks and five of eleven eighth grade textbooks had a reading level appropriate for the grade of their intended use.

d; ---; 22 textbooks; ---; ---; grs. 7, 8; ---; ---; ---.

Readability and vocabulary (d-7)

Troxel, Vernon. The Effects of Purpose on the Reading of Expository Mathematical Materials in Grade Eight. *J. Ed. Res.* 55: 221-227; Feb. 1962.

Students who read mathematical material to find the main idea achieved higher reading scores than those who read to answer a specific question. Reading score, however, was not found to be an accurate indicator of success in arithmetic.

(I) reading to find the main idea or to answer a specific question.
(D) achievement.

e; 3.4; 2-s, 3-s; 45 students; 3.4, 6.4; gr. 8; 20 days; norm;

27 (4, 3, 3, 3, 3, 3, 2, 3, 3).

Other References

Coffing, 1941	(f-2)
Dramer, 1970	(e-2a)
Hastings, 1941	(f-1a)
Johnson, J. T., 1949	(a-5b)
Rendahl, 1930	(d-8)
Stright, 1938	(a-5b)
Treacy, 1944	(a-5b)
Woody, 1932	(d-8)

Bailey, Ralph G. The Effect on the Achievement in Physics of Drills on the Mathematical Skills Needed in High School Physics. Sch. Sci. Math. 35: 89-91; Jan. 1935. (a-5a)

A limited amount of drill on mathematical skills resulted in improved scores on both mathematics and physics tests.

(I) drill. (D) achievement in mathematics and physics.

e; 3.1; 2-s, 3-m; 4 classes (120 students); 1.4, 1.5; gr. 11; 1 yr.;

norm, non-norm; 32 (3, 4, 4, 4, 4, 3, 4, 2, 4).

Cain, Ralph W. and Lee, Eugene C. An Analysis of the Relationship Between Science and Mathematics at the Secondary School Level. Sch. Sci. Math. 63: 705-713; Dec. 1963.

Science programs were analyzed to determine their mathematical content and sequence, and mathematics programs were analyzed to determine the correlation with science programs.

d; ---; ---; ---; ---; grs. 9-12; ---; ---; ---.

Carter, William Ray. A Study of Certain Mathematical Abilities in High School Physics. Math. Teach. 25: 313-331, Oct. 1932; 388-419, Nov. 1932; 451-469, Dec. 1932.

A test on mathematical concepts used in the study of physics was administered to students studying physics. A large percentage of students did not understand these concepts well enough to apply them in physics.

s; ---; ---; 404 students (13 schools); 1.6; gr. 11; ---; ---; ---.

Case, James B. Treating Chemical Equilibrium Mathematically in Secondary Schools: A Preliminary Investigation. Mar. 6, 1970. (ERIC Document No. ED 043 483)

The most intelligent one-fifth of students was most successful in understanding a mathematically-based approach to chemistry.

(I) chemistry unit. (D) achievement.

a; ---; ---; 89 students; ---; gr. 12; ---; non-norm: ---.

Quantitative concepts in
other curricular areas (d-8)

Forseth, William J. Does the Study of Geometry Help Improve Reading Ability? Math. Teach. 54: 12-13; Jan. 1961. (c-23)

Geometry students gained significantly more on a reading test than did non-geometry students.

(I) geometry course. (D) reading achievement.

f; ---; 2-s, 3-m; 482 students; 3.4; gr. 10; ---; norm; ---.

Hinkelman, Emmet Arthur. Relationship of Reading Ability to Elementary School Achievement. Ed. Adm. & Sup. 42: 65-67; Feb. 1956.

Correlations of arithmetic marks with reading marks were found to be .78 at grade 2, .71 at grade 5, and .77 at grade 7.

r; ---; 1-only; 30 students; 5.2; grs. 2, 5, 7; ---; norm; ---.

Lemmer, Jerome G. Is High School Mathematics an Adequate Preparation for High School Physics? Sch. Sci. Math. 30: 41-43; Jan. 1930. (f-1a)

Students scored below 50 per cent on a test of mathematics needed in physics.

s; ---; 1-only; 77 students; 1.6; gr. 11; ---; ---; ---.

Parque, Richard A. An Experimental Study to Investigate the Mathematical Needs of Students in a Traditional Physics Course. Sch. Sci. Math. 66: 405-408; May 1966. (e-1a, e-2)

Areas of mathematical difficulty in physics were noted; after a physics course, significant improvement was found in ten of the 15 areas.

(I) mathematics emphasis in physics. (D) achievement.

a; ---; 2-r; 51 students; 1.4, 3.4; gr. 11; ---; ---; ---.

Rendahl, J. L. The Mathematics Used in Solving Problems in High School Chemistry. Sch. Sci. Math. 30: 683-689; June 1930. (d-1, d-7)

Mathematical terms and operations used in problems in physics textbooks were collated.

d; ---; ---; ---; ---; gr. 11; ---; ---; ---.

Winegardner, J. H. The Relation Between Secondary Mathematics and Physics and Chemistry. Math. Teach. 32: 220-222; May 1939.

High correlations between grades in geometry and algebra and science grades were reported.

r; ---; ---; ---; 6.4; sec.; ---; ---; ---.

Woody, Clifford. Nature and Amount of Arithmetic in Types of Reading Material for the Elementary Schools. Ed. Outlook 6: 199-217; May 1932. (d-7)

The frequency count of Arabic and Roman numerals, fractions, decimals, units of measure, and arithmetical terms were presented in tabular form, with specific types and subject areas considered. It was concluded that these textbooks contained arithmetical material similar to that found in studies designed to ascertain knowledge of arithmetic needed in adult life. A wide variety of arithmetical terms must be understood if material in other subject areas is to be read meaningfully.

d; ---; ---; 38 textbooks, 9 magazines; 1.1; grs. 3-8; ---; ---;

---.

Zerbe, Hobson M. The Elements of Plane Geometry in High School Physics. Sch. Sci. Math. 30: 665-667; June 1930. (c-23)

Theorems found in physics books were tabulated.

d; ---; ---; 16 textbooks; 1.1; sec.; ---; ---; ---.

Quantitative concepts in other curricular areas (d-8)

Other References

Cain, 1966	(f-2)
Cowley, 1937	(c-7)
Eagle, 1948	(d-7)
Gabel, 1940	(d-7)
Higgins, 1969	(a-6)
Higgins, 1970	(a-6)
Klein, 1932	(f-2b)
McCallister, 1932	(d-7)
Moore, E. A., 1947	(e-5)
Rebert, 1932	(a-5h)
Whitla, 1962	(e-2d)

Brown, O. Robert, Jr. Using a Programmed Text to Provide an Efficient and Thorough Treatment of Solid Geometry Under Flexible Classroom Procedures. Math. Teach. 60: 492-502; May 1967. (c-23, d-5)

Students using UICSM programs improved in their ability to visualize and draw spatial relationships. Time and achievement had non-significant correlations, but achievement compared with norms from a standardized test was significantly greater.

(I) use of UICSM programmed text. (D) achievement.

a; ---; 2-s, 3-s; 190 students; 1.4, 1.5, 3.4, 6.4; grs. 10, 12;

6-8 wks.; norm, non-norm; ---.

DeVenney, William S. Final Report on an Experiment with Junior High School Very Low Achievers in Mathematics. SMSG Reports, No. 7. Stanford, California: Stanford University, 1969. 53 pp. (ERIC Document No. ED 042 630) (e-2a)

The program described in DeVenney (1968) was studied as it was used by eighth graders. At the end of the year, students in the conventional program scored higher on a test of computational skills; no meaningful differences were found on a test of applications. The experimental group achieved significantly higher on SMSG tests, and showed a highly positive attitude toward mathematics, while the conventional group seemed more negatively oriented than they had been when entering junior high.

(I) SMSG or conventional materials. (D) achievement; attitude.

e; 3.4 r; 1-only; 296 students; 1.4, 1.5, 6.2; gr. 8; 2 yrs.; norm,

non-norm; 25 (2, 3, 3, 4, 3, 2, 2, 3, 3).

Gupta, Ram K. Treatment Comparisons: Item Responses in Multi-Factor Repeated Measurements Designs. J. Exp. Ed. 37: 26-29; Summer 1969. (ERIC Document No. EJ 009 150) (d-1)

Data (supplied by Minnesota National Laboratory) were analyzed and discussed. SMSG and conventional texts were found to differ, with students using SMSG scoring higher.

(I) type of textbook. (D) achievement.

f; ---; 2-s, 3-r; 513 students; 3.2; gr. 9; 1 yr.; norm; ---.

Developmental projects (d-9)

Tatsuoka, Maurice M. and Comley, Robert E. UICSM Research Report Number 4, Some Comparisons of Mathematics Achievement in UICSM and Non-UICSM Classes in Inglewood, California. Dec. 1964. (ERIC Document No. ED 040 044)

UICSM students achieved significantly higher than groups using other materials.

(I) type of program. (D) achievement.

e; 3.4; 2-s, 3-m; 80 students; 3.5; sec.; ---; non-norm;

---.

Whitman, Nancy C. Project D: Program for Talented Students in Mathematics in Secondary Schools in Hawaii. Math. Teach. 59: 564-571; Oct. 1966. (e-3)

Students using SMSG materials in grades 7-9 achieved higher scores than those using UICSM materials, but both programs were profitable. Students using SMSG materials in grades 10-12 also achieved well in geometry and second-year algebra, but not as well as expected in trigonometry.

(I) type of curriculum. (D) achievement.

a; ---; 2-s; 80 students; 1.1, 1.3, 1.6, 3.4; grs. 7-12; ---; norm;

---.

Williams, Emmet D. and Shuff, Robert V. Comparative Study of SMSG and Traditional Mathematics Text Material. Math. Teach. 56: 495-504; Nov. 1963. (a-4, d-1, f-2)

No significant differences were found at the 7th grade level between groups using traditional or SMSG textbooks. Significant differences were found in favor of the traditional groups at the eighth grade level. After algebra, groups with SMSG training did not differ significantly from groups who had used traditional textbooks.

(I) SMSG or traditional program. (D) achievement.

e; 2.4; 2-r, 3-r; 678 students; 3.3, 3.4, 3.5, 3.16; grs. 7-10;

1 yr.; norm, non-norm; 17 (1, 2, 2, 3, 1, 2, 3, 1, 2).

Other References

Banghart & Spraker, 1963	(g-4)
Beberman & Van Horn, 1960	(t-2b)
Cahen, Romberg, & Zwirner, Spring 1970	(f-1a)
DeVenney, 1968	(e-2a)
Duncan, R., 1964	(f-4)
Easterday, 1964	(e-2a)
Ericksen & Ryan, 1966	(a-4)
Friebel, 1967	(a-4)
Goldberg, _et al._, 1966	(e-3)
Herriot, 1967	(e-2b)
Higgins, 1969	(a-6)
Higgins, 1970	(a-6)
Hively, 1968	(t-2b)
Nelson, L. D., 1965	(d-1)
Rising & Ryan, July 1966	(g-5)
Rising & Ryan, Aug. 1966	(t-2c)
Romberg & Wilson, 1968	(f-1a)
Rosen & Stolurow, 1964	(g-4)
Rosenbloom, _et al._, 1966	(f-4)
Ryan, 1967, 1968	(a-6)
Schlessinger & Helgeson, 1969	(r-2)
Small, Holtan, & Davis, 1967	(a-5e)
Van Horn, 1966	(g-4)
Westley & Jacobson, 1963	(d-4)
Westley & Severin, 1965	(d-4)

Diagnosis (e-1)

Dodes, Irving Allen. Four Investigations in the Improvement of Mathematics Instruction. *High Points* 36: 32-39; Feb. 1954. (c-21)

An annual promotion scheme for tenth and eleventh year mathematics was not successful, but a guidance procedure and a new more difficult sequence were successful. The standardization of general mathematics courses and the forming of remedial arithmetic classes made general mathematics more "respectable".

(I) type of remediation. (D) achievement; attitude.

a; ---; 1-only; ---; 1.6; grs. 9-12; ---; ---; ---.

Other References

Hightower, 1955	(f-1b)
Shapiro, Sitomer, Wolfson, & Eisner, 1945	(e-5)

Arthur, Lee E. Diagnosis of Disabilities in Arithmetic Essentials. Math. Teach. 43: 197-202; May 1950. (f-1b)

A test designed to measure 30 essential arithmetic skills was found to have a reliability of .88. Students scored higher on computation than on problem solving. More difficulty was noted in operations with fractions and decimals than with whole numbers.

s; ---; 1-only; 409 students; 1.3, 6.4; gr. 9; ---; non-norm; ---.

Bernstein, Allen. A Study of Remedial Arithmetic Conducted with Ninth Grade Students. Sch. Sci. Math. 56: 25-31; Jan. 1956. (e-2, f-1a)

A diagnostic checklist of 45 items was prepared on the basis of a previously administered test. Coding of the diagnostic items on Keysort cards done to check interrelationships resulted in 78 relationships which were tested for significance. Forty-two showed significant relationships. It appears that error patterns noted were not independent items.

r; ---; 1-only; 326 students; 1.6, 2.6; gr. 9; ---; norm, non-norm; ---.

Buckingham, Guy E. Diagnostic and Remedial Teaching in First Year Algebra. J. Ed. Res. 30: 198-213; Nov. 1936. (a-5a, c-22, e-2)

Errors made in solving monomials were tabulated; confusion of processes was the greatest single cause of error. Remedial drill work on errors was found to be effective.

s; ---; 2-r; 100 students; 1.1, 1.3; gr. 9; 24 wks.; norm, non-norm; ---.

Christofferson, H. C. The Plane Geometry Scholarship Tests in Ohio. Math. Teach. 26: 457-466; Dec. 1933. (c-23, f-1)

Students were found to be able to apply geometry principles to numerical problems and to do constructions fairly well, but did poorly in giving acceptable reasons and organizing proofs.

s; ---; 2-r; 300 students; 1.1, 1.3, 1.6; gr. 10; ---; ---; ---.

Error analysis (e-1a)

Clem, Orlie M. and Hendershot, Bertha Adams. Some Difficulties Involved in Solving Verbal Problems in Elementary Algebra. Math. Teach. 23: 141-147; Mar. 1930. (a-5b, c-22)

Reading problems, inability to do logical reasoning, and lack of systematic procedures, knowledge, and checking were found to be the major causes of failure to solve problems.

s; ---; 1-only; 80 students (4 classes); 1.1; gr. 9; ---; non-norm;

---.

Grossnickle, F. E. Errors and Questionable Habits of Work in Long Division with a One-Figure Divisor. J. Ed. Res. 29: 355-368; Jan. 1936. (c-3d)

1) Data from another study (Grossnickle, El. Sch. J. 34: 496-506, 590-599; Mar., Apr. 1934) were analyzed to determine types of errors and questionable habits made by students dividing with a one-figure divisor. Errors of combinations (38.8%) were most frequent in division, followed by multiplication and then subtraction.

2) Specific multiplication errors, remainder difficulties (23.8%), zero difficulties (13.5%), faulty procedures (9.5%), errors due to lapses of attention (8.9%), "bringing down" errors (5.5%), and questionable habits were tabulated.

3) Fifty-seven different errors and 13 questionable habits were found.

s; ---; 1-only; 453 students; 1.1, 1.6; grs. 5-8; ---; ---; ---.

Grossnickle, Foster E. Kinds of Errors in Division of Decimals and Their Constancy. J. Ed. Res. 37: 110-117; Oct. 1943. (c-5)

1) There were 21 different kinds of errors in division of decimals found. Forty per cent of all errors resulted from improper usage of the decimal divisor.

2) The average number of errors of each type was about the same in each of the four grades analyzed.

3) The only constant error resulted from dividing an integer by a decimal.

s; ---; 1-only; 400 students; 1.1, 1.6; grs. 6-9; ---; non-norm;

---.

Grossnickle, Foster E. and Snyder, John H. Constancy of Errors to Basic Facts in the Fundamental Operations in Arithmetic. J. Ed. Res. 32: 336-344; Jan. 1939. (c-3)

1) Most errors in addition and subtraction facts were sporadic, while those in multiplication and division were more constant.
2) Chance errors occurred in all four operations. The percentage of constant errors was small in advanced grades.
3) Errors in zero facts in addition and subtraction were constant in about three out of four cases, until the sixth grade level. Zero fact errors in multiplication persisted through grade 8, and in division through grade 7.

s; ---; 1-only; 500 students; 1.1; grs. 4-8; 5 testings; non-norm;

---.

Guiler, Walter Scribner. Improving Ability in Fractions. Math. Teach. 29: 232-240; May 1936. (c-4, e-2)

1) Data on specific weaknesses of the eighth graders, and error quotients for all students, are discussed.
2) Scores improved following individualized group remedial work, with decreases in number of types of errors and in error quotients.
3) Relationships were found to exist between IQ and test scores.

(I) remedial instruction; IQ. (D) achievement.

e; 1.2; 2-s; 58 students; 1.1, 1.4, 1.6, 6.4; grs. 6-8; 24 wks.

(18 hrs.); norm; 30 (2, 4, 5, 5, 4, 2, 3, 2, 3).

Henry, Lyle K. A Psychological Analysis of Students' Reasons for Specific Errors on Drill Materials in Plane Geometry. Math. Teach. 28: 482-488; Dec. 1935. (a-5a, c-23)

Nine types of errors made by students using drill materials were discussed. Confusing or mixing rules was the greatest problem.

s; ---; 1-only; 27 students (1 class); 1.1, 1.6; gr. 10; ---; ---;

---.

Error analysis (e-1a)

Kanarik, Rosella and Manwiller, C. E. How a High School Attacks Its Learning Difficulties in Reading and Arithmetic. Pittsburgh Sch. 11: 94-116; Jan./Feb. 1937. (f-1b)

Two-thirds of the students were below grade on the arithmetic reasoning subtest, while 82 per cent were below norm on the computation subtest. Data on errors were also presented.

s; ---; 1-only; 124 students; 1.6; gr. 7; ---; norm; ---.

MacRae, Margaret and Uhl, Willis L. Types of Errors and Remedial Work in the Fundamental Processes of Algebra. J. Ed. Res. 26: 12-21; Sept. 1932. (c-22, e-2)

Tests on the four fundamental processes of algebra were given, and errors classified by ability group. This was followed by remedial work, with comments for specific children cited.

a; ---; 1-only; 104 students; 1.1, 1.6; gr. 9; ---; non-norm; ---.

Randall, Rogers E. Common Errors Made in General Mathematics by High School Students of Louisiana. Math. Teach. 48: 228-231; Apr. 1955. (c-21)

Types of errors made by students on a competitive test were tabulated.

s; ---; 1-only; 131 students; 1.1, 1.4, 1.6; gr. 9; ---; non-norm; ---.

Snider, Everett. Errors in Ninth Grade Algebra. Math. Teach. 37: 175-176; Apr. 1944. (c-22)

The five largest groups of errors were found to be: forming equations from verbal problems; addition, subtraction, and multiplication of "directed" numbers; and substitution.

s; ---; 2-s, 3-m; 48 students; 1.6; gr. 9; 1 yr.; ---; ---.

Williams, Claude L. and Whitaker, Ruth L. Diagnosis of Arithmetic Difficulties. *El. Sch. J.* 37: 592-600; Apr. 1937. (c-3)

1) Almost all of the types of errors recorded by the Buswell-John Test were found with the students in this study. The leading difficulty resulted from errors in combinations. The habit of counting, zero difficulties, carrying, reading, and copying numbers also resulted in frequent errors.
2) Upper grades made no better showing than lower grades.
3) Grade 7A ranked first for fewest errors in addition, subtraction and division; grade 8A ranked first for multiplication. Grade 8B was lowest in addition; 4B, subtraction; 6A, multiplication; 5A, division.

s; ---; 2-s; 516 students; 1.6, 1.9; grs. 4-8; ---; norm; ---.

Other References

Grossnickle, 1935	(c-3d)
Grossnickle, Nov. 1941	(c-5)
Guiler, 1945	(c-4)
Guiler, Mar. 1946	(c-5)
Guiler, June 1946	(c-6)
Guiler & Hoffman, Oct. 1943	(b-6)
Guiler & Hoffman, Nov. 1943	(e-2)
Nelson, T., 1956	(f-1b)
Ohlsen, 1946	(f-2)
Paley, 1936	(c-16)
Parque, 1966	(d-8)
Schane, 1938	(c-4)

Diagnostic procedures (e-1b)

Eaton, Merrill T. The Value of the Dictaphone in Diagnosing Difficulties in Addition. Ind. U. Sch. Ed. B. 14: 5-10; Apr. 1938. (d-4)

Verbal, recorded responses during the pretest, and remedial drill situations, aided in diagnosing difficulties in addition.

c; ---; 2-s; 5 students; ---; grs. 1, 5, 8; 5 wks.; non-norm; ---.

Guiler, W. S. and Edwards, Vernon. An Experimental Study of Methods of Instruction in Computational Arithmetic. El. Sch. J. 43: 353-360; Feb. 1943.

Diagnosis of and individualized group instruction for the needs of students resulted in greater gain than for students who did not have such help.

(I) provision for individual needs or total-group instruction.
(D) achievement.

e; 3.1; 2-s, 3-m; 412 students; 1.4, 1.5, 1.6; grs. 7, 8; 23 wks.;

norm; 29 (2, 2, 3, 4, 4, 3, 4, 4, 3).

Noddings, Nellie L. Providing for Individual Rates of Learning in Mathematics. Math. Teach. 62: 543-545; Nov. 1969. (ERIC Document No. EJ 011 648)

A program in which students proceeded at individual rates through texts and tests was found to be successful.

(I) individualized pace. (D) achievement.

a; ---; 1-only; 134 students; 1.8, 1.10; gr. 11; ---; norm; ---.

Sprague, James B. Diagnostic Testing to Improve Mathematical Ability in Grade X. Sch. R. 47: 431-438; June 1939. (e-2, f-1a)

Remedial teaching following diagnostic testing resulted in improved scores.

(I) remedial techniques. (D) achievement.

a; ---; 1-only; 40 students; 1.1, 1.3; gr. 10; 4 mos.; norm,

non-norm; ---.

Other References

Bernstein, 1959	(r-2)
Randall, J. H., 1937	(e-2)
Thompson, R. B., 1941	(e-4)
Woody, Apr. 1930b	(e-2)

Remediation (e-2)

Bernstein, Allen. A Study of Remedial Arithmetic Conducted with Ninth Grade Students. Sch. Sci. Math. 56: 429-437; June 1956. (e-4)

1) Special practice material based on diagnosis of individual student error produced significant gain in achievement.
2) During the second phase of the study, students needing remedial instruction attended a mathematics clinic for individual instruction for one semester. This technique seemed to be more effective than large classes.

(I) showing subject his errors along with correct procedure; corrective practice material. (D) achievement.

a; ---; 1-only; 103 students; 3.4; gr. 9; 1 semester; norm, non-norm; ---.

Braverman, Benjamin. Handling the Repeater in First Term Geometry. High Points 23: 43-47; Feb. 1941. (c-23)

Placing repeaters in separate groups resulted in 85 per cent passing, compared with 64 per cent of those in regular groups.

(I) grouping "repeaters". (D) promotion.

a; ---; 1-only; 108 students; 1.6; gr. 10; ---; ---; ---.

Braverman, Benjamin. Remedial Arithmetic. High Points 26: 40-44; June 1944. (c-20)

After a course including individualized work, scores increased.

(I) remedial work. (D) achievement.

a; ---; 1-only; 195 students; 1.3, 1.6; sec.; ---; norm; ---.

Burton, Floyd H. Remedial Arithmetic in the Charles Bender Junior-Senior High School. Tex. Outlook 30: 28-30; Jan. 1946.

Remedial work on the fundamental operations and percentage resulted in significant gains.

(I) remedial instruction. (D) achievement.

a; ---; 1-only; 226 students; 1.4, 1.6; grs. 7-12; 1 yr.; norm; ---.

Byrne, Charles A.; Peters, Max S.; Zeiger, Bess; and Eisner, Harry. Improvement of Basic Skills in the 3 R's. *High Points* 37: 5-27; May 1955.

Procedures being used to improve basic mathematical skills were tabulated.

s; ---; 1-only; 8 schools; ---; sec.; ---; ---; ---.

Coleman, James C. Results of a "Total-Push" Approach to Remedial Education. *El. Sch. J.* 53: 454-458; Apr. 1953.

Remedial summer classes resulted in a mean increase of 1.2 grade level in arithmetic scores.

(I) remedial class. (D) achievement.

a; ---; 2-s; 20 students; 1.4; ages 8-16; 6 wks.; norm; ---.

Fogler, Sigmund. A Half-Pound of Cure Is Better Than None. *Sch. Exec.* 72: 62-63; June 1953.

Children who were given remedial help gained from nine months to two years four months in arithmetic test scores.

(I) remedial instruction. (D) achievement.

a; ---; 2-s; 23 students; 1.1; grs. 7, 8; 3 mos.; ---; ---.

Fox, David J. and Weinberg, Emmeline. *Summer Schools for Junior High and Intermediate School Pupils. Evaluation of New York City Title I Educational Projects, 1966-67.* Nov. 1967. (ERIC Document No. ED 034 010)

Students in the remedial program made "striking gains" in mathematics.

(I) remedial work. (D) achievement; attitude.

a; ---; 2-s; ---; ---; grs. 4-9; ---; ---; ---.

Remediation (e-2)

Gibney, Esther F. Aptitude Tests in Relation to the Teaching of Plane Geometry. Math. Teach. 42: 181-186; Apr. 1949. (c-23)

Students with low aptitude scores were placed in special classes; their achievement level was satisfactory compared with students in regular classes.

(I) type of group. (D) achievement.

a; ---; 2-s, 3-s; 157 students; 1.1, 1.3, 1.6; gr. 10; ---; norm;

---.

Guiler, W. S. and Hoffman, H. B. Improving Computational Habits of Ninth-Grade Pupils. Ed. Adm. & Sup. 29: 345-356; Sept. 1943. (c-21, c-22)

Students given remedial practice increased scores more than those not given remedial aid.

(I) remedial work. (D) achievement.

a; ---; 2-s; 238 students; 1.1, 1.4, 1.5, 1.6; gr. 9; 18 wks.

(21 hrs.); norm; ---.

Guiler, W. S. and Hoffman, H. B. Effect of Different Types of Mathematics Courses on Computational Ability. Ed. Adm. & Sup. 29: 449-456; Nov. 1943. (e-1a)

Students who were poor in computational skills improved most when in a course in which half of the work was on remedial arithmetic and half on algebra.

(I) remedial work or algebra only. (D) achievement.

a; ---; ---; 836 students; ---; gr. 9; 18 wks.; norm; ---.

Hillson, Henry T. Report on the Summer Session of the College Bound Program, July-August, 1967. 1967. (ERIC Document No. ED 016 728) (e-7)

Students made an average arithmetic computation gain of almost two years during the summer intensive program.

(I) remedial program. (D) achievement.

a; ---; 1-only; 1800 students; 1.3; grs. 9, 10; 1 summer; ---; ---.

Hitchcock, C. C. Fitting Ninth Grade Mathematics to the Needs and Abilities of Pupils. Ed. Adm. & Sup. 18: 462-465; Sept. 1932. (c-21, c-22)

Students were permitted to study general mathematics instead of straight algebra courses. This work was better adapted to the individual needs, and fewer students failed in the course than in algebra.

(I) type of program. (D) achievement.

a; ---; ---; ---; ---; gr. 9; ---; ---; ---.

Hogan, Robert T. and Horsfall, Robert B. An Evaluation of a High School Tutorial Program. July 1970. (ERIC Document No. ED 041 095)

No difference in achievement between boys given or not given a summer tutorial program was found, but the tutorial group had significantly more positive attitudes.

(I) summer tutorial program. (D) achievement; attitude.

a; ---; 1-only; 68 boys; 1.6; age 16; ---; ---; ---.

Mary Jacqueline, Sister. An Experiment in Remedial Teaching in Arithmetic. El. Sch. J. 41: 748-755; June 1941.

Students who were given remedial help in arithmetic showed achievement gains in all except three cases.

(I) remedial help. (D) achievement.

a; ---; 2-s; 11 students; ---; gr. 7; 1 semester; norm; ---.

Randall, Joseph H. Corrective Arithmetic in Junior High School. Ed. Meth. 16: 182-185; Jan. 1937. (e-1b)

Students with higher than average intelligence were able to correct faults in factual knowledge and process skills of addition of whole number and decimals, with motivated individual remedial work.

(I) remedial drill. (D) achievement.

Remediation (e-2)

a; ---; 2-s; 8 students; 1.1; gr. 8; 6-10 hrs.; norm; ---.

Woody, Clifford. Some Investigations Resulting from the Testing Program in Arithmetic: Case Study of a Girl in Grade VIIB Who Was Doing Unsatisfactory Work in Arithmetic. Ind. U. Sch. Ed. B. 6: 45-49; Apr. 1930(b). (3rd of 3 studies) (e-1b)

After diagnosis of arithmetic difficulties, three ten-minute periods per week were used for additional individualized practice. Achievement gain of one to three years was made in many areas but loss was noted in some subtests.

c; ---; ---; 1 student; ---; gr. 7; ---; norm; ---.

---. Afternoon Remedial and Enrichment Program, Buffalo, New York. Elementary Program in Compensatory Education, 2. 1969. (ERIC Document No. ED 038 468) (e-7)

Mean gains of six months in arithmetic achievement were found during the five months between testings.

a; ---; 1-only; ---; 1.5; grs. 3-8; 5 mos.; norm; ---.

---. Evaluation--Plus, 1966-1967. Sept. 1967. (ERIC Document No. ED 016 733) (e-7)

Students in the after-school Plus Program made mathematics achievement gains of 6 months during the five-month period, while those in the day program made mean gains of .7.

a; ---; ---; ---; ---; grs. 1-8; 5 mos.; norm; ---.

---. Junior High Summer Institutes, New York City. It Works. 1969. (ERIC Document No. ED 028 898)

An average gain of .5 year resulted from five weeks of remedial instruction.

(I) remedial work. (D) achievement.

a; ---; 2-s; ---; ---; grs. 6-8; 5 wks.; norm; ---.

---. *Learning Laboratory to Teach Basic Skills in a Culturally Deprived Area. Final Report.* July 1968. (ERIC Document No. ED 033 186) (e-7)

Groups receiving special training and guidance achieved at least as well as those not given the extra help.

(I) remedial training or regular program. (D) achievement.

a; ---; 1-only; ---; ---; sec.; ---; norm; ---.

---. *Plus Program, Buffalo, New York. Elementary Program in Compensatory Education, 2.* 1969. (ERIC Document No. ED 038 474) (e-7)

The Plus Program was described and evaluated.

a; ---; ---; ---; ---; grs. 1-8; ---; norm; ---.

Other References

Addleston, 1943	(a-5a)
Bernstein, Jan. 1956	(e-1a)
Bernstein, 1959	(r-2)
Buckingham, 1936	(e-1a)
Crawford, A. N., 1970	(d-6a)
Guiler, 1936	(e-1a)
MacRae & Uhl, 1932	(e-1a)
Mahin, 1946	(f-1b)
Morrow, 1965	(d-5)
Newman & Seiser, 1967	(e-7)
Nolen, Kunzelmann, & Haring, 1967	(g-6b)
Parque, 1966	(d-8)
Sprague, 1939	(e-1b)
Thompson, R. B., 1941	(e-4)
Weiss, 1969	(b-5)

Low achiever,
underachiever (e-2a)

Callahan, Leroy. Remedial Work with Underachieving Children. Arith. Teach. 9: 138-140; Mar. 1962.

A trend toward increased underachievement seemed to have been reversed by an individual diagnostic and remedial program.

(I) individual remedial program or regular instruction with textbook. (D) achievement.

a; ---; 2-s, 3-s; 20 students; 1.4, 1.10; gr. 8; 8-9 periods; norm;

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DeVenney, William S. Preliminary Report on an Experiment with Junior High School Very Low Achievers in Mathematics. SMSG Reports, No. 6. Stanford, California: Stanford University, 1968. 114 pp. (ERIC Document No. ED 021 754) (d-9)

A program incorporating daily worksheets, partially programmed lessons, and the use of tables to aid in computation was developed with low achieving seventh and eighth graders. The materials were then used with seventh graders; students using conventional textbooks made greater gains on standardized achievement tests than did those using the experimental materials, while the latter group did significantly better on most SMSG tests and on attitude scales.

(I) SMSG or conventional materials. (D) achievement; attitude.

e; 3.4; 2-s, 3-s; 22 classes; 1.4, 1.5, 3.5; grs. 7, 8; 2 yrs.;

norm, non-norm; 24 (2, 2, 3, 4, 3, 2, 2, 3, 3).

Douglass, Harl R. and Campbell, Ina. Factors Related to Failure in a Minneapolis Junior High School. El. Sch. J. 37: 186-189; Nov. 1936. (e-7, f-2b)

Differences in achievement on arithmetic computation between failing and non-failing students were greater than for most other subject areas. Such factors as age, attendance, intelligence, and socioeconomic status were found to be related to failure.

(I) failure or non-failure. (D) achievement.

f; ---; 1-only; 139 students; 1.3, 1.6; grs. 7-9; ---; norm; ---.

Dramer, Dan. Self-Contained, Reading-Oriented Classes in Secondary Schools. May 8, 1970. (ERIC Document No. ED 041 705) (d-7)

Instruction in reading resulted in seven months' increase in mathematics scores in a five-month period for a group of underachievers.

(I) instruction in reading. (D) achievement in mathematics.

a; ---; 1-only; 12 students; ---; gr. 10; 5 mos.; ---; ---.

Easterday, Kenneth E. An Experiment with Low Achievers in Arithmetic. Math. Teach. 57: 462-468; Nov. 1964. (d-9, e-4, f-2)

"Modern" (SMSG) and "traditional" mathematics materials were organized into a program for low achievers. Achievement made on a standardized achievement test indicated these students made a normal increase over the school year. Small group study was found to be workable classroom technique.

(I) SMSG or traditional program. (D) achievement.

a; ---; 2-s, 3-s; 4 classes; 1.3, 1.6; grs. 7, 8; 1 yr.; norm; ---.

Glavach, Mathew and Stoner, Donovan. Teaching the Unteachables. Calif. J. Ed. Res. 21: 111-119; May 1970. (ERIC Document No. EJ 021 514)

A program in which materials were selected to meet diagnosed needs of individuals and used with self-selection, pacing for success, and tangible rewards, resulted in almost half of the group of low achievers being assigned to regular classes.

(I) use of program for slow learners. (D) status.

a; ---; 1-only; 24 students; ---; gr. 9; 1 semester; ---; ---.

Homme, Lloyd E. A Demonstration of the Use of Self-Instructional and Other Teaching Techniques for Remedial Instruction of Low-Achieving Adolescents in Reading and Mathematics, Final Report. Aug. 13, 1965. (ERIC Document No. ED 003 150)

Materials for low achievers were found to be effective.

(I) type of material. (D) achievement.

a; ---; ---; ---; ---; sec.; ---; ---; ---.

Low achiever,
underachiever (e-2a)

Jones, Thomas. The Effect of Modified Programmed Lectures and Mathematical Games Upon Achievement and Attitude of Ninth-Grade Low Achievers in Mathematics. Math. Teach. 61: 603-607; Oct. 1968. (c-21, d-3, d-5, e-2b)

Use of a modified programmed lecture approach and mathematical games resulted in significant achievement and attitude gains, with no differences found between two IQ levels (above or below 85).

(I) remedial program; IQ. (D) achievement; attitude.

e; 3.3; 2-s, 3-r; 38 students; 1.4, 3.3, 3.4; gr. 9 (ages 15-17);

9 wks.; norm; 24 (2, 3, 3, 3, 3, 3, 2, 3, 2).

Lerch, Harold H. and Kelly, Francis J. A Mathematics Program for Slow Learners at the Junior High Level. Arith. Teach. 13: 232-236; Mar. 1966. (e-4)

Slow learners were identified, and taught a special curriculum in junior high mathematics as well as other subjects. The curriculum was the product of intense teacher-student interaction.

(I) special or traditional curriculum. (D) achievement.

e; 3.4; 2-r, 3-s; 74 students; 1.4, 3.13; gr. 7; 1 yr.; norm;

24 (2, 3, 3, 3, 3, 2, 3, 2, 3).

Lewis, Bill. Underachievers Measure Up. Am. Ed. 5: 27-28; Feb. 1969. (ERIC Document No. EJ 001 274)

A program involving field trips and use of calculators and other materials in a mathematics laboratory resulted in achievement gains.

(I) use of laboratory approach. (D) achievement.

a; ---; 1-only; 700 students; 1.5; gr. 9; ---; ---; ---.

Pitts, Clara L. A Partial Report of a Study of Failures in the First Year of High School. Peabody J. Ed. 15: 362-369; May 1938.

Many high ability students failed despite attention directed to helping them.

(I) remedial aid. (D) achievement.

a; ---; ---; ---; 1.6, 1.8; gr. 9; ---; ---; ---.

Ross, Ramon. A Description of Twenty Arithmetic Underachievers. *Arith. Teach.* 11: 235-241; Apr. 1964. (e-5)

To measure various dimensions of behavior among underachievers of average or above average IQ, a battery of tests, interviews, checklists, and screening devices were used. Among the results reported are:

1) Students evidenced satisfactory reasoning in word problems involving addition and subtraction, but made frequent errors with others.
2) They characteristically were withdrawn and defeated in attitudes toward school and society.
3) Sixty-three per cent of the causes of underachievement seemed emotional in nature.
4) About three-quarters showed immaturity or slowness in general development and abnormal physical conditions.
5) Parents tended to be from lower socioeconomic classes, and many held teachers responsible for a child's inadequacies.

c; ---; 2-s; 20 students; 1.1, 1.3, 1.6; grs. 6, 7; ---; norm; ---.

Other References

Broussard, Fields, & Reusswig, 1969	(a-4)
DeVenney, 1969	(d-9)
Ellis & Corum, 1969	(d-4)
Frankel, 1960	(f-2)
Hughes & Nelson, 1963	(g-6b)
Loughlin, O'Connor, Powell, & Parsley, 1965	(e-6)
Nelson, L. D., 1965	(d-1)
Silberman, *et al.*, 1962	(d-5)
Skager, 1969	(a-5i)
Smith, T. A. & Shaw, C. N., 1969	(f-1a)

Slow learner (e-2b)

Gibney, Thomas C. Multiplication for the Slow Learner. Arith. Teach. 9: 74-76; Feb. 1962. (c-3c)

No significant differences in achievement were found between slow learners who had or did not have a set of eight lessons reviewing multiplication, but those who had the review lessons scored significantly higher on a retention test.

(I) review lessons. (D) achievement.

e; 3.4 r; ---; ---; 3.4; gr. 7; 10 days (retention, 4 wks.);

non-norm; 29 (2, 4, 4, 4, 5, 2, 2, 3, 3).

Herriot, Sarah T. The Slow Learner Project: The Secondary School "Slow Learner" in Mathematics. SMSG Reports, No. 5. Stanford, California: Stanford University, 1967. 164 pp. (ERIC Document No. ED 021 755) (c-22, d-9).

It was concluded that slow learners showed a greater gain in achievement in the "new" mathematics when a "modified modern" text was studied and when the pace of instruction was less rapid.

(I) arithmetic or algebra course taught for one or two years.
(D) achievement.

e; 3.4; 2-s, 3-s; 1020 students; 1.4, 1.10, 3.3, 3.5, 6.4; grs.

7, 9; 2 yrs.; norm, non-norm; 13 (2, 1, 2, 2, 2, 1, 1, 1, 1).

Jerome, Sister Agnes. A Study of Twenty Slow Learners. J. Ed. Res. 53: 23-27; Sept. 1959. (f-2b)

1) Data on 20 slow-learners indicate a relationship between retardation and low intelligence and between retardation and "tool" subjects.

2) Sixty per cent of the cases were very low in total adjustment.

c; ---; 2-s, 3-s; 20 students; 1.1, 1.4, 1.6; grs. 3-8; ---; norm,

non-norm; ---.

Other References

Jones, T., 1968	(e-2a)	Paulson, 1964	(g-6b)

Blackman, Leonard S. and Capobianco, Rudolph J. An Evaluation of Programmed Instruction with the Mentally Retarded Using Teaching Machines. Am. J. Ment. Def. 70: 262-269; Sept. 1965. (d-5)

1) A group taught on teaching machines did not gain significantly more on standardized tests than a group taught by conventional methods, although both groups did gain significantly. On an experimenter-developed test, the group taught on teaching machines gained significantly more.

2) A long term retention test showed no significant differences, although for shorter retention intervals, scores differed.

3) Behavior change was significant for the machine-taught group.

(I) programmed instruction on teaching machines compared with conventional instruction. (D) achievement; behavior ratings.

e; 3.1 r; 2-s, 3-m; 36 students; 1.4, 1.5, 3.4; age 14; 1 yr. (retention, 3 1/2 mos.); norm, non-norm; 26 (3, 3, 4, 4, 4, 2, 2, 2, 2).

Cawley, John F. and Goodman, John O. Interrelationships Among Mental Abilities, Reading, Language Arts, and Arithmetic with the Mentally Handicapped. Arith. Teach. 15: 631-636; Nov. 1968. (f-2)

Significant correlations were found between:

1) Verbal and motor abilities with arithmetic concepts, reasoning, and computation.

2) Total reading performance with primary mental ability subtests, except space.

3) Computation and reading for older subjects, not younger.

4) Primary mental abilities and achievement for the majority of the intercorrelations.

r; ---; 2-s, 3-a; ---; 1.4, 6.4; grs. 1-8; ---; norm; ---.

Huber, William G. The Relationship of Anxiety to the Academic Performance of Institutionalized Retardates. Am. J. Ment. Def. 69: 462-466; Jan. 1965. (e-5)

In one school, the high anxiety group obtained a significantly higher mean score on arithmetic tests; no difference was found in a second school from which fewer students were "released".

Mentally retarded (e-2c)

(I) type of school. (D) achievement.

f; ---; 1-only; 153 students (2 schools); 1.4, 3.2; ages 13-17 (IQ 50-69); ---; norm; ---.

Meyen, Edward L. and Hieronymus, Albert N. The Age Placement of Academic Skills in Curriculum for the EMR. *Excep. Child.* 36: 333-339; Jan. 1970. (ERIC Document No. EJ 012 169) (b-5, f-2a)

The inclusion and placement of topics in the curriculum for EMR's were determined by surveying teachers and testing students. Comparisons were made with the behaviors of normal students.

s; ---; 2-s; 3595 students, 20 teachers; 1.4, 1.6, 1.9; ages 9-18; ---; ---; ---.

Schwarz, Robert H. and Shores, Richard E. The Academic Achievement of EMR Students and Social Class. *Am. J. Ment. Def.* 74: 338-340; Nov. 1969. (e-7)

Middle-class children achieved at a higher level on a standardized arithmetic test than lower-class children at ages 9-10, but the difference decreased by ages 14-15.

(I) social class; age. (D) achievement.

f; ---; 2-s; 52 students; 3.2, 3.3; ages 9, 10, 14, 15 (MR); ---; norm; ---.

Other References

Gothberg, 1949	(c-8)	Price, J. E., 1963	(d-5)
Graubard, 1964	(e-5)	Saxton, Blackman, & Tretakoff, 1963	(f-1a)
Jacobs, 1957	(f-2b)		
Layman, 1941	(e-5)		
Nolen, Kunzelmann, & Haring, 1967	(g-6b)		

Whitla, Dean K. Effect of Tutoring on Scholastic Aptitude Test Scores. Personnel & Guid. J. 41: 32-37; Sept. 1962. (d-8)

Tutoring in reading did not have any significant effect on students' SAT mathematics scores.

(I) tutoring in reading. (D) achievement in mathematics.

e; 3.4; 2-s, 3-m; 100 students; 1.4, 2.6, 3.4; gr. 11; 10 hrs.;

---; 26 (4, 4, 3, 4, 3, 2, 2, 2, 2).

Other Reference

Finck, 1935 (d-7)

Enrichment (e-3)

Albers, Mary Elizabeth and Seagoe, May V. Enrichment for Superior Students in Algebra Classes. J. Ed. Res. 40: 481-495; Mar. 1947. (c-22)

Achievement and interest of superior students who studied enrichment materials in time taken from the regular class period were compared with those of a group who did not use class time in this way.

(I) enrichment. (D) achievement; interest.

a; ---; ---; ---; ---; gr. 9; ---; ---; ---.

Erhart, Mother M. Arithmetic for the Academically Talented. Arith. Teach. 7: 53-60; Feb. 1960.

1) The survey supported the idea that administrators and instructors in private schools were putting forth serious effort for the academically talented.
2) Numerous reasons for a special program for the academically talented were cited.
3) Grouping and class size, time allotments, teaching experience, curriculum, textbooks, methods, and achievement were discussed.

s; ---; 1-only; 500 schools; ---; grs. 1-8; ---; ---; ---.

Goldberg, Miriam L.; et al. A Comparison of Mathematics Programs for Able Junior High School Students, Volume I--Final Report. May 1966. (ERIC Document No. ED 010 056; ED 010 057) (a-3, d-9, e-3b)

Acceleration resulted in greater achievement than did enrichment; the contemporary approach appeared superior to the standard one. The combination of acceleration and contemporary content and methods was most effective.

(I) six types of programs. (D) achievement; attitude.

a; ---; 1-only; 51 classes; ---; grs. 7-9; ---; ---; ---.

Hartung, Maurice L. High School Algebra for Bright Students. Math. Teach. 46: 316-321, 325; May 1953. (c-17, c-22)

Students made significant gains, despite initially high scores, after an enriched algebra course including mathematical methods of treating quantitative data using functions.

(I) enrichment procedure. (D) achievement.

a; ---; 1-only; 25 students; 1.3, 1.4, 1.10; gr. 9; 1 yr.; non-norm; ---.

Herring, Lewis Homer. Provisions and Procedures for the Rapid Learner in Selected Texas Junior High Schools. May 1962. (ERIC Document No. ED 021 351)

A survey of procedures used in administering and instructing rapid learners resulted in recommendations for a plan for locating such students and organizing programs.

s; ---; 2-s; 40 schools; ---; grs. 7-9; ---; ---; ---.

Hildreth, Gertrude. The Educational Achievement of Gifted Children. Child Develop. 9: 365-371; Dec. 1938. (f-2)

Data for children with IQ's over 140, between 130 and 140, and below 110 were compared. Despite incomplete records, the group with IQ's over 140 was consistently higher in school achievement. The difference was greatest in reading, next largest in spelling, and smallest in arithmetic.

s; ---; 2-s; 50 students; 1.1, 1.3; grs. 2-8; ---; norm; ---.

Lane, Ruth. The Use of Graded Originals in Plane Geometry. Math. Teach. 33: 291-300; Nov. 1940. (c-23)

Students who selected the level of problem to solve achieved higher scores on a final test than those who worked a specified number and type of problem.

(I) specified or self-selected problems. (D) achievement; time.

e; 3.4; 2-s, 3-m; 18 classes (370 students); 1.4, 1.6, 1.8, 3.15, 6.4; gr. 10; 28 days; norm, non-norm; 38 (4, 4, 4, 4, 4, 4, 5, 5, 4).

Norton, Monte Scott. A Study of Practices and Provisions for the Gifted Pupil in Mathematics. J. Ed. Res. 53: 316-317; Apr. 1960.

Acceleration was used by 25 per cent of the schools; 35 per cent used grouping; 91 per cent provided elective courses.

Enrichment (e-3)

s; ---; 2-s; 104 schools; 1.6; sec.; ---; ---; ---.

Prouse, Howard L. Creativity in School Mathematics. Math. Teach. 14: 876-879; Dec. 1967. (g-4)

Correlations between achievement, IQ, GPA, preferences, teacher rating, and creativity test scores were found in an attempt to determine a procedure for identifying gifted students.

r; ---; 2-s; 312 students (14 classes); 3.4, 6.4; gr. 7; ---; norm, non-norm; ---.

Other References

Arends & Ford, 1964	(e-3b)
Berman, 1965	(e-3b)
Cromack, 1970	(g-5)
Devitt, 1961	(d-4)
Frankel, 1960	(f-2)
Kennedy, W. A.; Cottrell, T. B.; & Smith, A. H., 1964	(e-5)
Kennedy, W. A. & Walsh, J., 1965	(g-4)
Meconi, Dec. 1967	(r-2)
Porter, 1938	(r-2)
Scaramuzzi, 1956	(c-2)
Whitman, 1966	(d-9)

Overachiever (e-3a)

[No research reports were assigned with a primary reference to this category.]

Other References

Degnan, 1967	(e-5)
Loughlin, O'Connor, Powell, & Parsley, 1965	(e-6)
Silberman, *et al.*, 1962	(d-5)

Acceleration (e-3b)

Anderson, Frank H.; Bedford, Fred; Clark, Van; and Schipper, Joan. A Report of an Experiment at Camelback High School. Math. Teach. 56: 155-159; Mar. 1963. (c-22)

Students in a class of 80 scored as well as students in a class of 40.

(I) class size. (D) achievement.

a; ---; 2-s, 3-r; 120 students; 1.1, 1.3, 1.4; gr. 9; 1 yr.; norm;

---.

Arends, Richard and Ford, Paul M. Acceleration and Enrichment in the Junior High School: A Follow-Up Study. July 1964. (ERIC Document No. ED 028 558; ED 001 220) (e-3)

Two of five classes having a program of acceleration and enrichment were significantly superior to regular classes in achievement on standardized mathematics tests.

(I) enrichment and acceleration or regular program.
(D) achievement; attitude.

a; ---; 2-s; 7 classes (175 students); ---; gr. 9; 1 yr.; norm; ---.

Baker, Russell R. Program Provisions in Michigan Junior High Schools for Superior Students in Mathematics. Math. Teach. 55: 556-559; Nov. 1962. (b-3)

About one-fifth of the schools, enrolling one-fourth of the seventh graders and one-third of the eighth graders in Michigan, indicated they had special mathematics programs for superior students. Achievement test results were favorable for eighth graders taking algebra.

s; ---; ---; 482 schools; 1.3, 1.4, 1.6, 3.3; grs. 7, 8; ---; norm;

---.

Baldauf, Robert J. A Comparison of the Extent of Educational Growth of Mentally Advanced Pupils in the Cedar Rapids Experiment. J. Ed. Res. 52: 181-183; Jan. 1959. (f-2b)

Only in grade 7 were significant differences found in arithmetic; these favored the enriched group.

(I) two types of program--enriched or typical. (D) achievement.

e; 3.21; 2-r, 3-s; 95 students; 3.3, 3.5; grs. 4-7; ---; norm;

24 (1, 3, 4, 4, 4, 2, 2, 2, 2).

Berman, Linda. The High School Achievement of Former Two- and Three-Year Special Progress Junior High School Students. Grad. Res. in Ed. & Related Disciplines 1: 25-37; Nov. 1965. (e-3)

Students in the enriched three-year junior high program achieved significantly higher mean mathematics grades in high school than students in a two-year accelerated program. The majority in both groups felt that they had been extremely well-prepared in mathematics.

(I) enriched or accelerated program. (D) achievement.

f; ---; 2-s, 3-m; 200 students; 1.4, 1.5, 1.6; gr. 11; ---; non-

norm; ---.

Chapman, John J. Selection Criteria vs. Performance in High-Ability Secondary-School Student Programs. Math. Teach. 55: 381-384; May 1962. (c-22, f-2c)

Students entering grade 12 who took college algebra achieved successfully; grades were judged to be better predictors of success than was IQ.

(I) college algebra in grade 12. (D) achievement.

a; ---; 2-s; 23 students; ---; gr. 12; 6 wks.; ---; ---.

Hegstrom, William J. and Riffle, Donald E. A Two-Year Study of Eighth-Grade Algebra I. Arith. Teach. 10: 419-423; Oct. 1963. (c-22, f-2c)

At least 15 per cent of each of two eighth grade classes were found to be able to succeed in algebra. Median scores were higher than for ninth grade groups.

(I) teaching of algebra in grade 8. (D) achievement.

a; ---; 2-s; 60 students; 1.3, 1.6, 1.10, 5.2, 6.4; gr. 8; 1 yr.

(replicated); norm; ---.

Herr, William A. Junior High School Accelerants and Their Peers in Senior High School. Sch. R. 45: 186-195; Mar. 1937.

Students who were accelerated one year in junior high school achieved as well in mathematics as comparable students who were not accelerated.

(I) acceleration in junior high school. (D) achievement in senior high school.

f; ---; 2-s, 3-m; 194 students; 1.1, 1.4, 3.15; gr. 12; ---; norm,

non-norm; ---.

Justman, Joseph. Academic Achievement of Intellectually Gifted Accelerants and Non-Accelerants in Junior High School. Sch. R. 62: 142-150; Mar. 1954.

Students in special-progress classes showed significantly higher attainment than those in regular classes. When ninth-grade items were eliminated, students were not significantly different on computational subtests.

(I) type of class. (D) achievement.

f; ---; 2-m, 3-s; 166 students; 1.4, 1.5, 3.4; grs. 7-9; ---; norm;

---.

Justman, Joseph. Academic Achievement of Intellectually Gifted Accelerants and Non-Accelerants in Senior High School. Sch. R. 62: 469-473; Nov. 1954.

Students who had been accelerated one year in junior high achieved at least as well in senior high as students who had not been accelerated.

(I) acceleration. (D) achievement.

f; ---; 2-m; 472 students; 1.4, 1.5; grs. 10, 11; ---; norm; ---.

Klausmeier, Herbert J. and Wiersma, William. Effects of Condensing Content in Mathematics and Science in the Junior High School. Sch. Sci. Math. 64: 4-11; Jan. 1964.

Bright students who took three years of mathematics and science in two years achieved as well in algebra as those who had the regular program, but had significantly lower scores in geometry.

(I) accelerated or regular program. (D) achievement.

e; 3.21; 2-s; 7 groups; 1.4, 1.10, 3.2; grs. 7-12; 3 yrs.; norm;

24 (2, 2, 3, 4, 3, 2, 3, 2, 3).

Pauley, B. G. An Evaluation of a Secondary-School Mathematics Program for Able Pupils. Math. Teach. 54: 324-332; May 1961. (b-3)

Evaluation of a program for able mathematics students indicated favorable responses from students and achievement gains above the norms for able students.

(I) enrichment program. (D) achievement.

a; ---; 1-only; 607 students; 1.1, 1.3; grs. 7-12; 2 yrs.; norm;

---.

Rusch, Reuben R. and Clark, Richard M. Four Years in Three: An Evaluation. El. Sch. J. 64: 281-285; Feb. 1963.

1) In arithmetic and reading, the accelerated group was as ready for ninth grade as a group one year older.
2) Arithmetic achievement of the accelerated group was higher than that of a non-accelerated group.
3) The accelerated group continued to be at least as well adjusted as control groups.

(I) effect of acceleration with enriched program during summer.
(D) achievement; adjustment.

e; 3.22; 2-s, 3-m; 4 groups; 1.3, 1.4; grs. 4-8; 3 yrs.; norm;

24 (3, 3, 2, 3, 2, 4, 3, 2, 2).

Acceleration (e-3b)

Unzicker, S. P. A Study of Acceleration in the Junior High School. Sch. R. 40: 346-356; May 1932. (c-22)

Algebra scores for accelerated students were almost as high as scores for non-accelerated students.

(I) acceleration in junior high school. (D) achievement.

e; 3.8; 2-s, 3-s; 52 students; 1.3, 1.8; gr. 9; 1 yr.; norm, nonnorm; 32 (2, 3, 4, 4, 3, 4, 5, 3, 4).

Wilkins, Walter L. High-School Achievement of Accelerated Pupils. Sch. R. 44: 268-273; Apr. 1936.

Accelerated students tended to achieve as well as non-accelerated students; they ranked above average in their graduating class.

s; ---; 2-s; 282 students; 1.6; gr. 12; ---; ---; ---.

Other References

Goldberg, et al., 1966 (e-3)
Messler, 1961 (f-2a)

Balow, Irving. The Effects of "Homogeneous" Grouping in Seventh-Grade Arithmetic. Arith. Teach. 11: 186-191; Mar. 1964.

1) Sectioning on the basis of arithmetic tests given at the end of 6th grade and teacher judgment did not result in homogeneous sections in the 7th grade.
2) Children who knew least at the beginning of the year gained most; level of ability was also positively related to achievement gain.

r; ---; 2-s; 353 students; 1.1, 3.3, 3.5, 6.4; gr. 7; 1 yr.; norm,

non-norm; ---.

Bierden, James E. Behavioral Objectives and Flexible Grouping in Seventh Grade Mathematics. J. Res. Math. Ed. 1: 207-217; Nov. 1970. (a-4, a-5i)

An intra-class grouping plan using instruction and independent work for individualized objectives resulted in significant gains in computational skills, concept knowledge, and attitude, with a reduction in anxiety.

(I) use of behavioral objectives with flexible groups.
(D) achievement; attitudes.

e; 3.21; 1-only; 44 students; 3.4; gr. 7; 1 yr.; norm, non-norm;

19 (2, 2, 3, 3, 3, 1, 2, 1, 2).

Crosby, Gwladys and Fremont, Herbert. Individualized Algebra. Math. Teach. 53: 109-112; Feb. 1960. (c-22)

Students who planned their own work in small groups achieved as well as those taught as a class.

(I) type of planning. (D) achievement.

a; ---; 1-only; 4 classes; 1.3, 1.4; grs. 9, 10; 1 yr.; norm; ---.

Fawcett, Will M.; et al. Improving the Teaching of Mathematics: A Departmental Project. Calif. J. Ed. Res. 3: 159-163; Sept. 1952.

Following a program designed to help teachers individualize instruction to meet needs, a class with a median IQ of 85 gained 1.2 years on an achievement test, one with a median IQ of 91 gained 1.4 years, and one with a median IQ of 103 gained 1.4 years.

Grouping procedures (e-4)

(I) use of procedures to individualize instruction. (D) achievement.

a; ---; 1-only; 3 classes; 1.3; grs. 7, 8; 1 yr.; norm; ---.

Gadske, Richard Edward. A Comparison of Two Methods of Teaching First Year High School Algebra. Sch. Sci. Math. 33: 635-640; June 1933. (c-22)

Students taught by an individualized procedure achieved significantly more than those taught as a group.

(I) individual or group instruction. (D) achievement.

e; 3.1; 2-s, 3-m; 46 students; 1.1, 1.4; gr. 9; 1 yr.; norm;

24 (1, 2, 3, 4, 3, 2, 4, 3, 2).

Johnson, Donovan A. A Study of the Relative Effectiveness of Group Instruction. Sch. Sci. Math. 56: 609-616; Nov. 1956. (c-15)

No significant differences were found between students taught in small groups by another student and regular teacher-led classes.

(I) small group or regular instruction. (D) achievement.

e; 3.8; 2-r, 3-r; 48 students; 1.6, 3.2, 3.5, 3.19; gr. 12; 6 days;

norm, non-norm; 26 (2, 4, 3, 4, 2, 3, 2, 3, 3).

Johnson, Mauritz and Scriven, Eldon. Class Size and Achievement Gains in Seventh- and Eighth-Grade English and Mathematics. Sch. R. 75: 300-310; Sept. 1967. (ERIC Document No. ED 016 653)

Class size was not found to have a consistent effect on gains made on a standardized mathematics test.

(I) size of class. (D) achievement.

f; ---; 2-s; 135 classes; 1.3, 1.4, 1.5, 3.2, 4.3; grs. 7, 8; ---;

norm; ---.

Linn, Marguerite. An Experimental Comparison of Two Methods of Teaching Elementary Algebra. Sch. Sci. Math. 34: 983-985; Dec. 1934. (a-4, c-22)

Little difference in achievement scores was found between groups using recitation or unit plan (involving laboratory work or supervised study) methods, but attitudes favored the unit plan.

(I) traditional recitation method or unit plan. (D) achievement.

a; ---; 2-s, 3-m; 64 students; 1.5; gr. 9; 30 wks.; norm; ---.

Love, William P. Individual Versus Paired Learning of an Abstract Algebra Presented by Computer Assisted Instruction. 1969. (ERIC Document No. ED 034 403) (c-22, d-6a)

No significant differences were found between students using a CAI course in Boolean algebra individually or in pairs.

(I) paired or individual instruction. (D) achievement; attitude.

e; 3.1; 2-s, 3-m; 54 students; 3.3, 6.4; sec.; 9 days; ---; ---.

Savard, William G. An Evaluation of an Ability Grouping Program. Calif. J. Ed. Res. 11: 56-60; Mar. 1960.

Upper-range-limited grouping showed a significant difference only in arithmetic reasoning. In lower-range-limited grouping classes, however, there was a significant advantage in three of the four areas.

(I) limited-range or regular grouping. (D) achievement.

f; ---; 2-s, 3-s; 1200 students; 1.4, 1.6; grs. 4-8; 1-10 mos.;

norm; ---.

Shanks, R. H. An Experiment in Teaching Solid Geometry. Sch. Sci. Math. 32: 614-621; June 1932. (c-23, d-2)

The class using lesson sheets independently or in small groups achieved a higher mean score than the class having regular instruction.

(I) conventional or lesson-sheet instruction. (D) achievement.

Grouping procedures (e-4)

a; ---; 1-only; 2 classes; 1.6; sec.; 5 wks.; non-norm; ---.

Thompson, R. B. Diagnosis and Remedial Instruction in Mathematics. *Sch. Sci. Math.* 41: 125-128; Feb. 1941. (e-1b, e-2)

Students who followed an individualized program of test-drill-test achieved higher gains than control groups having regular instruction. This was true for the seventh grades studied in the four-year period.

(I) individualized or conventional method. (D) achievement.

e; ---; 2-s, 3-m; 56 students (8 classes); 1.1, 1.4; gr. 7; 10 wks.

(4 yrs.); norm; 36 (2, 3, 4, 4, 5, 5, 5, 4, 4).

Willcutt, Robert E. Ability Grouping by Content Topics in Junior High School Mathematics. *J. Ed. Res.* 63: 152-156; Dec. 1969. (ERIC Document No. EJ 016 030)

No significant differences in achievement were found between students who were grouped by ability or heterogeneously grouped. The ability-grouped students made significant attitude increases.

(I) ability grouping. (D) achievement; attitude.

e; 3.4; 2-s, 3-s; 240 students (8 classes); 1.4, 1.5, 3.4; gr. 7;

1 yr.; norm, non-norm; 29 (1, 4, 5, 4, 3, 3, 3, 3, 3).

Other References

Banghart & Spraker, 1963	(g-4)	Lerch & Kelly, 1966	(e-2a)
Bernstein, June 1956	(e-2)	Paulson, 1964	(g-6b)
Douglass, Dec. 1936	(r-2)	Stallard & Douglass, 1935	(a-4)
Drake, 1935	(a-4)	Stephens, 1960	(a-6)
Easterday, 1964	(e-2a)	Willcutt, Mar. 1969	(a-3)
Hudgins & Smith, 1966	(a-5b)	Wright, R. E., 1970	(a-4)
Kertes, 1932	(f-2c)		

Armstrong, Clairette P. and Heisler, Florence. Some Comparisons of Negro and White Delinquent Boys. J. Genet. Psychol. 67: 81-84; Sept. 1945. (f-2)

Negro boys did not score as high on arithmetic tests as did white boys.

s; ---; 1-only; 400 boys; 1.4; ages 14-15; ---; norm; ---.

Ayers, Jerry B.; Bashaw, W. L.; and Wash, James A. A Study of the Validity of the Sixteen Personality Factor Questionnaire in Predicting High School Academic Achievement. Ed. & Psychol. Meas. 29: 479-484; Summer 1969. (ERIC Document No. EJ 005 062)

Correlations of personality factors with mathematics achievement were low. Good mathematics students tend to be withdrawn, conscientious, emotional, immature, and lacking in frustration tolerance.

r; ---; 1-only; 75 students; 1.4, 3.3, 6.3, 6.4; gr. 10; ---; ---;

---.

Clem, Orlie M. and Hovey, Chester W. Comparative Achievement of Village-School Pupils and Rural-School Pupils. El. Sch. J. 34: 269-272; Dec. 1933. (f-2)

Village-school students were superior to rural-school students in arithmetic; mean marks were higher than those in the majority of elementary-school subjects. Village girls exceeded village boys, but in rural schools the reverse was true.

(I) type of background. (D) achievement.

f; ---; 1-only; 389 students; 1.4, 1.5, 3.15; grs. 1-8; ---; norm;

---.

Physical, psychological, and/or social characteristics (e-5)

Coers, Walter C. Comparative Achievement of White and Mexican Junior High School Pupils. Peabody J. Ed. 12: 157-162; Jan. 1935. (f-2)

1) White children achieved significantly higher scores on achievement tests than Mexican children. When mental ability is considered, Mexican children were found to be achieving more for their level.
2) Relative achievement of Mexican groups was greatest on the arithmetic computation test.

(I) ethnic background. (D) achievement.

f; ---; 2-s; 194 students; 1.4, 3.17, 6.4; grs. 6-8; ---; norm; ---.

Conway, Pauline E. and Nemzek, Claude L. The Relationship of School Marks to the Amount of Illness. J. Genet. Psychol. 61: 315-320; Dec. 1942. (f-2)

No significant difference in arithmetic marks was found between students who had or had not been ill frequently.

s; ---; 2-m; 400 students; 1.4, 3.15; gr. 9; ---; ---; ---.

Degnan, Joseph Arthur. General Anxiety and Attitudes Toward Mathematics in Achievers and Underachievers in Mathematics. Grad. Res. in Ed. & Related Disciplines 3: 49-62; Apr. 1967. (a-6, e-3a)

Achievers had a higher level of general anxiety and more positive attitudes toward mathematics than did underachievers.

s; ---; 2-s, 3-m; 44 students; 1.4, 3.4; gr. 8; ---; norm; ---.

Feinberg, Henry. Achievement of a Group of Socially Maladjusted Boys as Revealed by the Stanford Achievement Test. J. Soc. Psychol. 26: 203-212; 1947.

1) On the average the boys tested were from 1 year 3 months to 2 years 4 months retarded when compared with the grade in which the boy was placed. Achievement in arithmetic was poorest.
2) Arithmetic items appeared to correlate with other subjects to a lesser degree than did any other subject.

s; ---; 2-s; 872 students; 1.4, 1.5, 6.4; ages 10-17; ---; norm; ---.

Feinberg, Henry. Achievement of a Group of Children in Foster Homes as Revealed by the Stanford Achievement Test. J. Genet. Psychol. 75: 293-303; 1949.

Foster home children were found to achieve on a higher level in all areas except arithmetic reasoning than maladjusted children.

(I) foster home or maladjusted children. (D) achievement.

f; ---; 1-only; 100 students; 1.4, 1.5, 3.15, 6.4; ages 9-16; ---; norm; ---.

Feinberg, Henry. Achievement of Children in Orphan Homes as Revealed by the Stanford Achievement Test. J. Genet. Psychol. 85: 217-229; 1954.

Children in orphan homes were found to achieve better than children in maladjusted groups, but not as well as those in foster homes. Arithmetic was found to be one of the most difficult subjects.

(I) orphan home, maladjusted, or foster home children.
(D) achievement.

f; ---; 1-only; 138 students; 1.4, 1.5, 3.15, 6.4; ages 9-15; ---; norm; ---.

Flynn, John T. Contribution of a Non-Cognitive Variable to Geometry Achievement Using an Auto-Instructional Procedure. J. Ed. Res. 62: 449-452; July/Aug. 1969. (ERIC Document No. EJ 007 183) (c-23, d-5)

No significant difference between the achievement of students taught by programmed or conventional instruction at any anxiety level was found.

(I) programmed or conventional instruction; anxiety level.
(D) achievement.

Physical, psychological, and/or social characteristics (e-5)

e; 3.4; 1-only; 150 students (6 classes); 3.2, 3.5, 6.4; grs. 10-12; ---; non-norm; 25 (3, 3, 3, 3, 3, 3, 2, 2, 3).

French, John W. Effect of Anxiety on Verbal and Mathematical Examination Scores. Ed. & Psychol. Meas. 22: 553-564; Fall 1962. (f-2)

Differences in the effect of anxiety on test-taking were not consistent and rarely significant, except that girls who felt anxious did well on the mathematics test.

(I) time of test; anxiety level. (D) achievement.

e; 2.8; 2-m, 3-r; 16 schools; 1.1, 6.4; gr. 12; ---; norm, non-norm; 28 (4, 2, 3, 4, 2, 3, 4, 3, 3).

Graubard, Paul S. The Extent of Academic Retardation in a Residential Treatment Center. J. Ed. Res. 58: 78-80; Oct. 1964. (e-2c, f-2b)

There was no significant difference between reading comprehension and arithmetic scores.

(I) past and present psychiatric history and treatment.
(D) achievement.

f; ---; 2-s, 3-s; 21 students; 1.4, 3.4; ages 10-16; ---; norm; ---.

Haggard, Ernest A. Socialization, Personality, and Academic Achievement in Gifted Children. Sch. R. 65: 388-414; Dec. 1957.

Specific characteristics of a group of high achievers were discussed. The high arithmetic achievers tended to view their environment with curiosity, felt capable, had the best-developed and healthiest egos, could express feelings freely, were emotionally controlled and flexible, showed the most independence of thought.

s; ---; 2-s; 45 students; ---; grs. 3-9; 7 yrs.; norm, non-norm; ---.

Hastings, J. Thomas. Tensions and School Achievement Examinations. J. Exp. Ed. 12: 143-164; Mar. 1944. (f-2c)

Students showing higher tensions at the time of an examination produced examination results which tended to deviate further from prediction than did the results of those with lower tensions.

r; ---; 1-only; 80 students (3 classes); 1.4, 6.4; gr. 9; 4 tests;

non-norm; ---.

Kennedy, W. A.; Cottrell, T. B.; and Smith, A. H. EPPS Norms for Mathematically Gifted Adolescents. Psychol. Reports 14: 342; Apr. 1964. (e-3)

Preference Schedule items were tabulated; the factors of Achievement and Autonomy were highest, while Order was surprisingly low.

s; ---; 1-only; 160 students; 1.4; sec.; ---; norm; ---.

Kennedy, Wallace A. and Willcutt, Herman. Youth-Parent Relations of Mathematically-Gifted Adolescents. J. Clin. Psychol. 19: 400-402; Oct. 1963. (a-6)

The gifted students viewed their families as bordering on negative and autocratic relationships.

s; ---; 2-s; 228 students; ---; gr. 12; ---; norm; ---.

Kochnower, William. Personality Factors and Success in Mathematics. High Points 43: 65-72; Apr. 1961. (e-6)

Students whose mathematics achievement exceeded their average achievement were found to have a tendency to react emotionally, and could be characterized as non-conformists. Few girls had the requisite criterion scores.

r; ---; 2-s; 434 students; 3.13; grs. 9-11; ---; norm; ---.

Physical, psychological, and/or social characteristics (e-5)

Lane, Howard A. and Witty, Paul A. The Educational Attainment of Delinquent Boys. J. Ed. Psychol. 25: 695-702; 1934.

1) Achievement was poorest in those subject areas which require drill: language usage and arithmetic computation. Achievement was highest in arithmetic reasoning.
2) From analysis of data from tests given at the beginning and end of the year to 169 boys, it was found that a gain of 14 months was made on computation, while reasoning scores increased only six months.

s; ---; 2-s; 650 students; 1.1, 1.3, 1.4, 1.5, 1.8, 6.4; age 14;

---; norm; ---.

Layman, Emma McCloy. A Comparison of the Effectiveness of Rural and Graded School Systems in Meeting the Needs of the Mentally Retarded Child. Am. J. Ment. Def. 45: 84-96; 1941. (a-3, e-2c)

Students in rural schools achieved better on arithmetic computation than those in town schools.

(I) type of school. (D) achievement.

f; ---; 1-only; 510 students; 1.6; ages 6-17; ---; norm; ---.

Lessing, Elise E.; Zagorin, Susan W.; and Nelson, Dorothy. WISC Subtest and IQ Score Correlates of Father Absence. J. Genet. Psychol. 117: 181-195; Dec. 1970. (ERIC Document No. EJ 029 219) (f-2, f-4)

A history of prolonged father absence was associated with lower scores on arithmetic subtests for boys.

(I) father absence. (D) achievement.

f; ---; 1-only; 433 students; 1.4, 3.2, 3.3; ages 9-15; ---; norm;

---.

Lewis, Marian. Teaching Arithmetic Computation Skills. Ed. Vis. Handicapped 2: 66-72; Oct. 1970. (ERIC Document No. EJ 028 360) (d-3)

A survey of the computational aids used in classes for the visually handicapped was reported.

s; ---; ---; 74 questionnaires; ---; elem., sec.; ---; ---; ---.

Mann, Lester; Taylor, Raymond G., Jr.; Proger, Barton B.; Dungan, Roy H.; and Tidey, William J. The Effect of Serial Retesting on the Relative Performance of High- and Low-Test Anxious Seventh Grade Students. J. Ed. Meas. 7: 97-104; Summer 1970. (ERIC Document No. EJ 021 368) (f-2)

Improvement in performance on a numerical test occurred in all ability levels; no anxiety-by-trial interaction was found.

(I) anxiety level; ability level. (D) achievement.

e; 3.27; 2-s, 3-s; 149 students; 3.2; gr. 7; 4 testings; ---;

24 (4, 2, 3, 3, 3, 3, 2, 2, 2).

Manuel, H. T. A Comparison of Spanish-Speaking and English-Speaking Children in Reading and Arithmetic. J. Appl. Psychol. 19: 189-202; Apr. 1935. (f-2)

1) The average arithmetic score of the Spanish-speaking children was greater than that of the English-speaking children in grades 2, 3, 4, and 6, but less in reading in every grade except the second.
2) Differences between reading and arithmetic scores were greater for Spanish-speaking than for English-speaking children.

s; ---; 2-s; 3200 students; 1.1, 1.4, 1.12; grs. 2-8; ---; norm;

---.

Physical, psychological, and/or social characteristics (e-5)

McGrath, Robert T. Achievement in One-Room Schools. Sch. Exec. 56: 438-439; July 1937. (f-2)

1) No decided advantage for either standard or non-standard schools was found on tests of arithmetic reasoning. Standard schools ranged from 48 per cent to 75 per cent below normal.
2) There were no outstanding differences between the two types of schools on tests of computation. Ranges for standard schools were 62 per cent to 94 per cent below normal, whole those for non-standard schools were 42 per cent to 93 per cent below normal.
3) Combined scores showed that differences favored each type of school in different quartile ranges.

s; ---; 1-only; 290 students; 1.1, 1.3, 1.4, 1.5, 1.6, 1.8, 3.15;

grs. 4-8; ---; norm; ---.

McIntosh, H. W. and Schrammel, H. E. A Comparison of the Achievement of Eighth Grade Pupils in Rural Schools and in Graded Schools. El. Sch. J. 31: 301-306; Dec. 1930.

Scores on scholarship tests of students from graded and rural schools were similar except the measures of central tendency were higher for the former group. Somewhat less variability existed for the rural group. When scores of the highest 31 per cent were compared, scores of graded school students were higher, with the greatest differences found in arithmetic, reading, and spelling.

(I) rural or graded school background. (D) achievement.

f; ---; 2-s; 3532 students; 1.1, 1.3, 1.4, 1.6, 1.8; gr. 8; ---;

---; ---.

Moore, E. A. Reading and Arithmetic Abilities Associated with Speech Defects. J. Speech Dis. 12: 85-86; Mar. 1947. (d-8)

Test scores for students with various types of speech defects were compared.

s; ---; 2-s; 236 students; 1.4; gr. 9; ---; ---; ---.

Moore, Joseph E. A Comparative Study of the Educational Achievement of Delinquent and Dependent Boys. Peabody J. Ed. 14: 1-6; July 1936. (f-2)

Both delinquent and orphaned boys scored lowest on arithmetic sections of an achievement test, with delinquents scoring dedicedly lower than orphans.

s; ---; 2-s; 237 boys; 1.3, 1.6; 14-18 yrs.; ---; norm; ---.

Osborne, R. T. Racial Differences in Mental Growth and School Achievement: A Longitudinal Study. Psychol. Reports 7: 233-239; Oct. 1960. (f-2)

Differences in arithmetic achievement of white and Negro students increased between sixth and tenth grades: a gap of one year existed at grade 6; two years, at grade 8; four years, at grade 10.

(I) white or Negro. (D) achievement.

f; ---; 1-only; 1261 students; 1.1; grs. 6, 8, 10; 4 yrs.; norm;

---.

Osborne, R. T. and Miele, Frank. Racial Differences in Environmental Influences on Numerical Ability as Determined by Heritability Estimates. Perceptual Motor Skills 28: 535-538; Apr. 1969. (ERIC Document No. EJ 006 568)

It was concluded that environment does not play a significantly greater role in the development of numerical ability among Negro children than among white children.

(I) Negro or white twins. (D) achievement.

f; ---; 2-m; 568 students; 6.4; ages 13-18; ---; non-norm; ---.

Pusey, Harriet C. Arithmetic Achievement of Japanese-Americans. Math. Teach. 38: 172-174; Apr. 1945.

Japanese-American students scored slightly below the expected level for their grade on reasoning tests and slightly above grade norms on tests of fundamentals.

s; ---; 1-only; 484 students; 1.1, 1.3; grs. 7-9; ---; norm; ---.

Physical, psychological, and/or social characteristics (e-5)

Sackett, Everett B. The Effect of Moving on Educational Status of Children. El. Sch. J. 35: 517-526; Mar. 1935. (f-2)

Reanalysis of data from Joy's master's thesis indicated that transient students in the Panama Canal Zone excelled in all areas measured except in arithmetic computation.

(I) transient or "native" background. (D) achievement.

f; ---; 1-only; 202 students; 1.3, 1.5; grs. 7, 8; ---; norm; ---.

Shapiro, Marie; Sitomer, Harry; Wolfson, Harry C.; and Eisner, Harry. A Study of Failure in Mathematics. High Points 27: 18-33; Apr. 1945. (e-1)

Sixteen characteristics and behavior patterns which appeared to be significantly associated with failure in mathematics were determined. The four most commonly mentioned causes of failure were lack of study and attention, poor work habits, lack of ability, lack of interest in or dislike of mathematics.

s; ---; 2-s; 183 students; 1.1; sec.; ---; ---; ---.

Shaver, James P. and White, Darrell K. Social Need and Learning in Algebra with Programed Instruction. J. Exp. Ed. 35: 94-96; Fall 1966. (c-22, d-5)

Of the personality variables tested, only "school relations" was found to be significantly correlated with achievement on programmed lessons; however, mental ability was significantly correlated to both the personality factor and achievement.

r; ---; 1-only; 93 students; 6.4; gr. 10; ---; norm; ---.

Stewart, Lawrence H.; Dole, Arthur A.; and Harris, Yeuell Y. Cultural Differences in Abilities During High School. Am. Ed. Res. J. 4: 19-31; Jan. 1967. (e-6, f-1b)

Increases in profiles of mean scores were observed for all ethnic groups except those of Hawaiian ancestry. No sex differences were found except for Japanese groups.

s; ---; 2-r; 815 students; 3.2, 3.3, 3.8; grs. 10, 12; ---; norm;

---.

White, William F. and Aaron, Robert L. Teachers' Motivation Cues and Anxiety in Relation to Achievement Levels in Secondary School Mathematics. J. Ed. Res. 61: 6-9; Sept. 1967. (f-4, g-5)

Girls appeared to be more sensitive to the motive-arousing cues of mathematics teachers and more in fear of failure. Significant differences in perception of achievement cues among achievement-level groups and between sexes were found.

(I) achievement level; sex. (D) motivation variables.

f; ---; 1-only; 185 students (6 classes); 1.4, 3.2, 3.3, 3.9; grs.

11, 12; ---; non-norm; ---.

Zintz, Miles V. Academic Achievement and Social and Emotional Adjustment of Handicapped Children. El. Sch. J. 51: 502-507; May 1951.

Arithmetic scores for children with various types of physical handicaps were presented; the degree of retardation increased with age.

s; ---; 2-r; 500 students; 1.3, 1.6, 3.15; grs. 6-8; ---; norm; ---.

Other References

Aiken, Mar. 1970	(r-2)
Hilton & Myers, 1967	(f-2c)
Huber, 1965	(e-2c)
Johnson, R. T. & Anderson, R. A., 1964	(a-7)
Loughlin, O'Connor, Powell, & Parsley, 1965	(e-6)
Martens, 1954	(a-3)
Nolen, Kunzelmann, & Haring, 1967	(g-6b)
Randall, R. E., 1953	(f-1b)
Richardson, H. M. & Surko, E. F., 1956	(f-2b)
Riffenburgh, 1960	(r-2)
Ross, R., 1964	(e-2a)
Salzinger, 1957	(f-2)
Schnur, 1969	(g-4)
Smith, T. A. & Shaw, C. N., 1969	(f-1a)

Sex differences (e-6)

Alexander, Vincent E. Sex Differences in Seventh Grade Problem Solving. Sch. Sci. Math. 62: 47-50; Jan. 1962. (a-5b)

1) Whether intelligence was controlled or not, there were no significant differences between sexes on problem-solving ability.
2) On 11 factors, significant differences in favor of high achievers of either sex were found. On a twelfth factor, general reasoning ability, high achieving boys were not found superior to low achieving boys.
3) Problem solving reading skills were not found to be correlated with problem solving ability, but problem solving ability was correlated with MA, CA, and IQ for each sex. Differences between correlations for boys and girls were not significant.

r; ---; 1-only; 623 students (320 boys, 303 girls); 2.6; gr. 7; ---;

norm; ---.

Burgert, Robert H. The Relation of School Marks to Intelligence in Secondary Schools. J. Appl. Psychol. 19: 606-614; Oct. 1935. (f-2b, f-2c)

Mathematics marks for boys were significantly higher than for girls. A correlation of .41 was found between marks and IQ.

s; ---; 1-only; 191 students; 1.4, 2.12, 6.4; gr. 9; ---; ---; ---.

Douglass, Harl R. and Olson, Newman E. The Relation of High-School Marks to Sex in Four Minnesota Senior High Schools. Sch. R. 45: 283-288; Apr. 1937. (t-2d)

Men teachers tended to give boys and girls about the same mark in mathematics, while women teachers rated girls higher.

s; ---; 2-r, 3-m; 1676 students; 1.1, 1.4, 1.6; sec.; ---; ---; ---.

Foran, T. G. and O'Hara, Brother Colombiere. Sex Differences in Achievement in High-School Geometry. Sch. R. 43: 357-362; May 1935. (c-23, f-2b)

At all levels of intelligence, boys' scores on a geometry test were considerably higher than girls' scores.

(I) sex; IQ. (D) achievement.

f; ---; 2-m; 873 students; 1.4, 3.15; gr. 10; ---; non-norm; ---.

Loughlin, Leo J.; O'Connor, Henry A.; Powell, Marvin; and Parsley, Kenneth M., Jr. An Investigation of Sex Differences by Intelligence, Subject-Matter Area, Grade, and Achievement Level on Three Anxiety Scales. J. Genet. Psychol. 106: 207-215; June 1965. (e-2a, e-3a, e-5)

Significant differences on anxiety scales were found between achievement levels on arithmetic reasoning and fundamental tests at varying IQ levels in each grade.

(I) IQ; sex; achievement level; grade. (D) anxiety.

f; ---; 2-s; 5020 students; 3.2, 3.4; grs. 4-8; ---; norm, non-norm; ---.

Pease, Glenn R. Sex Differences in Algebraic Ability. J. Ed. Psychol. 21: 712-714; Dec. 1930. (c-22)

Boys made more errors on algebraic problems than did girls.

s; ---; 1-only; 372 students; 1.1; gr. 9; ---; non-norm; ---.

Powell, Marvin; O'Connor, Henry A.; Deutsch, Murray; and Parsley, Kenneth M., Jr. Are There Really Sex Differences in Achievement? J. Ed. Res. 57: 210-212; Dec. 1963.

No significant differences were found between sexes for either arithmetic reasoning or fundamentals.

(I) intelligence level; sex. (D) achievement.

f; ---; 1-only; 5020 students; 3.15; grs. 2-8; ---; norm; ---.

Powell, Marvin; O'Connor, Henry A.; and Parsley, Kenneth M., Jr. Further Investigation of Sex Differences in Achievement of Under-, Average-, and Over-Achieving Students Within Five IQ Groups in Grades Four Through Eight. J. Ed. Res. 57: 268-270; Jan. 1964.

1) Boys scored higher on arithmetic reasoning, especially those with IQ's of 115 or more.
2) Girls scored higher on arithmetic fundamentals.

Sex differences (e-6)

(I) intelligence level; sex. (D) achievement.

f; ---; 1-only; 3551 students; 1.6, 3.4; grs. 4-8; ---; norm; ---.

Ross, Verne R. A Preliminary Investigation of the Effect of Radio Reception on School Achievement. J. Appl. Psychol. 14: 456-464; Oct. 1930. (d-4)

Radio accompaniment had little effect on arithmetic test scores.

(I) radio playing during testing. (D) achievement.

a; ---; 1-only; 77 students; 1.6; grs. 11, 12; 2 days; norm; ---.

Sheehan, T. Joseph. Patterns of Sex Differences in Learning Mathematical Problem-Solving. J. Exp. Ed. 36: 84-87; Summer 1968. (f-2a)

Girls achieved higher scores than boys; when the effects of previous achievement, aptitude, IQ, and reading ability were removed, boys were found to be superior.

r; ---; 2-s, 3-r; 107 students; 1.4, 3.3, 6.2; gr. 9; 5 wks.; norm,

non-norm; ---.

Stroud, J. B. and Lindquist, E. F. Sex Differences in Achievement in the Elementary and Secondary Schools. J. Ed. Psychol. 33: 657-667; Dec. 1942.

Girls maintained a consistent and on the whole significant superiority over boys in all subjects tested except for arithmetic, where small, insignificant differences favored boys. On high school tests, most differences favored boys.

(I) sex. (D) achievement.

f; ---; 2-r; 2450 students; ---; grs. 3-8; 1 testing; norm; ---.

Other References

Alkire, 1954	(f-2)
Amatora, 1961	(a-6)
Blank, 1933	(r-2)
Butler, 1930	(a-6)
Cronin, 1967	(a-4)
Easterday, K. & Easterday, H., 1968	(d-5)
Feldhusen, Treffinger, & Elias, 1970	(f-2c)
Gay, 1969	(g-2)
Kochnower, 1961	(e-5)
Osborn, 1939	(a-6)
Stewart, Dole, & Harris, 1967	(e-5)
Swineford, Oct. 1949	(g-4)
Unkel, 1966	(f-2)
Very & Iacono, 1970	(f-2)

Socioeconomic differences (e-7)

Harrison, Forest I. Opportunity As It Is Related To Home Background and School Performances. Sch. R. 77: 144-151; June 1969. (ERIC Document No. EJ 005 650) (a-6, f-3)

Analysis of data resulting from a recent international study revealed that advantaged-successful students generally had more opportunity to learn than disadvantaged or advantaged-unsuccessful groups.

(I) type of background. (D) achievement.

f; ---; 2-s; 6 countries; 1.4, 3.2; age 13; ---; norm; ---.

Keough, John J. The Relationship of Socio-Economic Factors and Achievement in Arithmetic. Arith. Teach. 7: 231-237; May 1960.

The relationship between such factors as father's occupation, parents' birthplace, newspapers read, type of concern, and arithmetic achievement were considered and discussed.

(I) varied background factors. (D) achievement.

s; ---; 1-only; 7 classes; 1.1, 1.8; gr. 8; ---; non-norm; ---.

Newman, Thomas B. and Seiser, William. The Floating Teacher--Help for the Mathematically Disadvantaged. Math. Teach. 60: 753-755; Nov. 1967. (e-2)

Students given remedial help made significant gains in achievement and attitude.

(I) use of floating teacher. (D) achievement; attitude.

a; ---; 2-s; 1023 students; ---; grs. 7-9; 1 semester; ---; ---.

Other References

Douglass & Campbell, 1936	(e-2a)
Hillson, 1967	(e-2)
MacArthur & Mosychuk, 1966	(f-2c)
Mayeske & Weinfeld, 1967	(f-1a)
Schwarz & Shores, 1969	(e-2c)
Unkel, 1966	(f-2)
ERIC Document No. ED 038 468, 1969	(e-2)
ERIC Document No. ED 016 733, 1967	(e-2)
ERIC Document No. ED 033 186, 1968	(e-2)
ERIC Document No. ED 038 474, 1969	(e-2)

Testing (f-1)

Braverman, Benjamin. The Regents' Examination vs. a Standard Achievement Test in Plane Geometry. *High Points* 12: 13-17; Nov. 1930.

The average correlation between Regents and achievement test scores was .55; correlations between each test and teachers' marks were .62 and .66.

r; ---; 1-only; 3 classes (102 students); 6.4; gr. 10; ---; norm,

non-norm; ---.

Linn, Robert L. A Note on the Stability of the Iowa Tests of Basic Skills. *J. Ed. Meas.* 6: 29-30; Spring 1969. (ERIC Document No. EJ 006 710)

High correlation (.73) was reported between fifth grade and eighth grade ITBS arithmetic scores.

r; ---; 1-only; 9972 students (64 schools); 1.4; grs. 5, 8; ---;

---; ---.

Other References

Christofferson, 1933	(e-1a)
Hughes & Nelson, 1963	(g-6b)
Tsao, 1944	(f-2a)
Whitcraft, 1933	(b-3)

Bloom, B. S. The 1955 Normative Study of the Tests of General Educational Development. Sch. R. 64: 110-124; Mar. 1956. (f-2)

The average student score on GED mathematics tests in 1955 exceeded by 58 per cent the scores of students in 1943. Data for high and low states were presented.

(I) type of background. (D) achievement.

f; ---; 2-r; 834 schools (38,773 students); 1.6, 1.10, 2.12; gr.

12; ---; norm; ---.

Bowman, Herbert Lloyd. A Technique for Determining the Relationship Between Reported Preference and Performance. J. Appl. Psychol. 16: 288-297; June 1932. (a-5b, a-6)

The procedures used in developing a problem-preference test and in determining its reliability and validity were presented. Preference scores were found to correlate (.56) with achievement scores.

r; ---; 1-only; 564 students; 1.1, 1.3, 1.4, 1.9, 6.4; grs. 7-9;

---; non-norm; ---.

Cahen, Leonard S.; Romberg, Thomas A.; and Zwirner, Walter. The Estimation of Mean Achievement Scores for Schools by the Item-Sampling Technique. Ed. & Psychol. Meas. 30: 41-60; Spring 1970. (d-9)

The item-sampling technique was found to be satisfactory, with the precision of estimation increasing as the number of students tested in a school increased.

s; ---; 2-s, 3-r; 81 schools; 1.4, 1.5, 2.6, 3.2, 6.2, 6.4; gr. 9;

---; norm; ---.

Cahen, Leonard S.; et al. A Comparison of School Mean Achievement Scores with Two Estimates of the Same Scores Obtained by the Item-Sampling Technique. Nov. 1970. (ERIC Document No. ED 052 241)

Reasonably close estimates of mean performance were obtained from the item-sampling situation as compared to means estimated from the conventional type testing.

Analysis and validation
of tests (f-1a)

r; ---; 2-r; 35 schools; ---; gr. 12; ---; ---; ---.

Capron, Virginia Lee. The Relative Effect of Three Orders of Arrangement of Items Upon Pupils' Scores in Certain Arithmetic and Spelling Tests. J. Ed. Psychol. 24: 687-695; Dec. 1933.

1) For tests on problems, the random order resulted in the smallest percentage of error and the hard-to-easy order resulted in fewer errors than the easy-to-hard order. For processes, there was practically no difference in percentages of error due to arrangement.
2) When differences due to order were calculated, and IQ and sex considered, a few were significant, but in general which arrangement or order was best could not be concluded.

(I) order of arrangement of test items. (D) achievement.

e; 3.4; 2-s, 3-m; 453 students; 1.6, 1.9; grs. 5, 8; ---; norm;

17 (2, 1, 2, 1, 3, 2, 3, 2, 1).

Chen, Tso-Yu L. and Chow, Huai-Hsui. Factor Study of a Test Battery at Different Educational Levels. J. Genet. Psychol. 73: 187-199; Dec. 1948. (a-7)

Correlations from a test battery administered to Chinese students were presented; general, verbal, spatial, and numerical factors were identified as expected, with the general factor increasing as grade level increased.

r; ---; 1-only; 782 students; 6.1, 6.4; grs. 4, 7, 9, 10, college;

---; ---; ---.

Connor, William L. and Hawkins, Gertrude C. What Materials Are Most Useful to Children in Learning to Solve Problems? Ed. Meth. 16: 21-29; Oct. 1936. (a-5b)

This is a report of the development of problem solving tests in Cleveland. It was found that the best material for use in teaching problem solving seemed to be problems selected by students from their environment, with supplementary "dynamic" problems created by teachers.

(I) type of test material. (D) achievement.

a; ---; 1-only; ---; 1.3; grs. 2-8; 8 yrs.; norm; ---.

Dinkel, Robert E. Prognosis for Studying Algebra. Arith. Teach. 6: 317-319; Dec. 1959. (f-2c)

An aptitude test was developed and was found to be correlated .66 with grades in algebra.

r; ---; 1-only; ---; 6.6; grs. 8, 9; ---; non-norm; ---.

Dunlap, Jack W. The Predictive Value of Interest Test Items for Achievement in Various School Subjects. J. Appl. Psychol. 19: 53-58; Feb. 1935. (a-6, f-2c)

Items logically designated as "arithmetic" were found to be more specific for prediction than were items from other content areas.

r; ---; 1-only; 280 students; 1.6, 6.4; gr. 7; ---; ---; ---.

Foran, T. G. and Lenaway, Sister M. Albert. Comparative Difficulty of Three Forms of Computation Tests. J. Ed. Res. 31: 568-571; Apr. 1938. (c-3)

Variations in scores on two types of mixed fundamentals tests and one separated fundamentals test were found, but the three forms did not differ significantly in difficulty.

s; ---; 1-only; 1026 students; 1.4, 1.5; grs. 5-7; ---; non-norm;

---.

Frost, Norman F. and Brances, Louis Grant. Factors for Predicting Success in Beginning Algebra. Calif. J. Ed. Res. 7: 79-83; Mar. 1956. (c-20, c-22, f-2c)

A test of basic arithmetic skills was found to correlate .54 with success in algebra, while IQ correlated .51 and eighth grade arithmetic marks, .15.

r; ---; 1-only; 132 students; 1.6, 6.4; gr. 9; ---; norm, non-norm;

---.

Analysis and validation
of tests (f-1a)

Garrett, Wiley S. The Number Relations Section of the Carnegie Mental Ability Tests Treated as a Power Test. Ed. & Psychol. Meas. 7: 309-318; Summer 1947.

Increasing time limits for the tests did not affect results.

r; ---; 1-only; 155 students; 1.3, 1.8, 6.4; gr. 12; ---; norm; ---.

Giles, George C., Jr. Predictive Validity of Progressive Matrices and Two Other Nonlanguage Tests of Mental Ability. J. Ed. Meas. 1: 65-67; June 1964. (f-2b)

Correlations between arithmetic achievement and three mental ability scores ranged from .49 to .57.

r; ---; 2-r; 127 students; 2.12, 3.2, 6.4; grs. 8, 9; ---; norm; ---.

Grossnickle, Foster E. Concepts in Social Arithmetic for the Eighth Grade Level. J. Ed. Res. 30: 475-488; Mar. 1937. (a-2, c-5)

1) A test on taxation, stocks, bonds, banking, insurance and merchandizing was developed after analysis of 13 textbooks. Great variation was found in the books. Sixty-eight concepts were noted.
2) The average score was 42; the range of mastery was from 11.5 per cent to 95.8 per cent.
3) The group who completed the eighth grade in June scored significantly higher than January graduates.

s; ---; 2-s; 1337 students; 1.1, 1.4, 1.6, 1.9; gr. 8; ---; non-norm; ---.

Hastings, J. Thomas. Testing Junior High School Mathematics Concepts. Sch. R. 49: 766-776; Dec. 1941. (d-7)

To ascertain students' mathematic vocabulary concepts, it was found that a number of exercises should be used for each word.

r; ---; 1-only; 331 students; 6.4; gr. 9; ---; non-norm; ---.

Jeffery, Jay M. Psychological Set in Relation to the Construction of Mathematics Tests. Math. Teach. 62: 636-638; Dec. 1969. (ERIC Document No. EJ 014 116) (g-3, g-4)

Students were found to develop a definite set toward problem solutions. Suggestions for classroom tests are discussed.

(I) use of sets of problems. (D) psychological set.

a; ---; 1-only; 30 students; 1.1; gr. 12; ---; non-norm; ---.

Kenney, John J. Mathematics in Group Intelligence Tests. J. Ed. Res. 44: 129-133; Oct. 1950.

The percentage of mathematics items on 22 tests varied from .9 to 56.3.

d; ---; ---; 22 tests; 1.6; sec.; ---; ---; ---.

Kvaraceus, W. C. and Lanigan, Mary A. Pupil Performance on the Iowa Every-Pupil Tests of Basic Skills Administered at Half-Year Intervals in the Junior High School. Ed. & Psychol. Meas. 8: 93-100; Spring 1948. (f-2)

A correlation of .59 was found between arithmetic and IQ tests.

r; ---; 1-only; 27 students; 1.4; grs. 6-8; ---; ---; ---.

Lee, J. Murray and Lee, Dorris May. The Construction and Validation of a Test of Geometric Aptitude. Math. Teach. 25: 193-203; Apr. 1932. (c-23, f-2c)

A test of geometric aptitude was found to correlate with achievement (.72) and to have high reliability (.91).

r; ---; 1-only; 735 students; 6.4; gr. 10; ---; ---; ---.

Mayeske, George W. and Weinfeld, Frederic D. Factor Analyses of Achievement Measures from the Educational Opportunities Survey. Jan. 18, 1967. (ERIC Document No. ED 013 280) (e-7, g-4)

Factor analysis revealed that five subtest scores (related to mathematics) could be combined to form one "index of achievement" score.

Analysis and validation
of tests (f-1a)

r; ---; 1-only; 11 groups; 6.1; gr. 9; ---; ---; ---.

McBee, George and Duke, Ralph L. Relationship Between Intelligence, Scholastic Motivation, and Academic Achievement. *Psychol. Reports* 6: 3-8; Feb. 1960. (f-2b)

Intelligence and motivation scores significantly affected arithmetic scores.

s; ---; 2-s; 180 students; 3.2; gr. 7; ---; norm; ---.

Pinsky, Paul and Gorth, William P. *Descriptive Analysis of HS420: Eleventh Grade Algebra, First Semester*. July 1969. (ERIC Document No. ED 042 794) (c-22, f-2c)

A set of nine cognitive ability tests were found to be poor predictors of achievement. Suggestions for monitoring instruction were made.

r; ---; ---; ---; ---; gr. 11; ---; ---; ---.

Romberg, Thomas A. and Wilson, James W. The Development of Mathematics Achievement Tests for the National Longitudinal Study of Mathematical Abilities. *Math. Teach.* 61: 489-495; May 1968. (d-9)

Development of tests involved: 1) a scheme for classification of components of mathematic ability; 2) selection of 11 basic content areas; 3) cognitive categorization of behaviors associated with content areas; 4) solicitation of ideas for testing understanding; 5) writing initial test items; and 6) two pilot testings and editings for final form.

d; ---; 1-only; ---; ---; grs. 4-12; 5 yrs.; ---; ---.

Sabers, Darrell L. and Feldt, Leonard. An Empirical Study of the Effect of the Correction for Chance Success on the Reliability and Validity of an Aptitude Test. *J. Ed. Meas.* 5: 251-258; Fall 1968. (c-22, f-2c)

Use of "guess" or "do not guess" directions had no significant effect on the predictive validity or reliability of an algebra aptitude test.

f; ---; 2-r, 3-r; 1000 students; 6.2, 6.3, 6.4; gr. 8; 9 mos.;

norm; ---.

Saunders, David R. A Factor Analysis of the Information and Arithmetic Items of the WAIS. Psychol. Reports 6: 367-383; June 1960. (f-2b)

Six factors from the WAIS Information and Arithmetic subtests were found and interpreted. Scholastic aptitude appeared to be a composite of cultural knowledge, numerical information, and numerical operations.

r; ---; 1-only; 228 boys; 6.1, 6.4; sec., college; ---; norm; ---.

Saxton, George H.; Blackman, Leonard S.; and Tretakoff, Maurice I. Achievement Measurement and Academic Grade Placement in Educable Mental Retardates. Am. J. Ment. Def. 67: 748-750; Mar. 1963. (e-2c)

High correlations were found between two achievement tests.

r; ---; 1-only; 109 students; 3.4, 6.4; age 15; ---; norm; ---.

Seder, Margaret. An Experimental Study of a New Mathematics Test for Grades 7, 8, and 9. Math. Teach. 32: 259-264; Oct. 1939.

Data were presented to indicate reliability of the test and intercorrelations of forms and subtests.

r; ---; ---; ---; ---; grs. 7-9; ---; norm; ---.

Smith, Timothy A. and Shaw, Carl N. Structural Analysis as an Aid in Designing an Instructional System. J. Ed. Meas. 6: 137-143; Fall 1969. (ERIC Document No. EJ 012 277) (c-3a, c-5, e-2a, e-5)

Ten structural characteristics of 100 addition examples were derived and used as predictors of problem difficulty level, for potential use in planning lessons.

r; ---; 2-s; 97 boys; 6.2; ages 10-16; ---; non-norm; ---.

Analysis and validation
of tests (f-1a)

Stokes, C. N. and Finch, F. H. A Comparison of Norms on Certain Standardized Tests in Arithmetic. El. Sch. J. 32: 785-787; June 1932.

Variations in grade levels achieved on three standardized tests are presented. Differences between .74 and .77 of a grade were found.

s; ---; 1-only; 65 students; 1.4; grs. 7-9; ---; norm; ---.

Sueltz, Ben A. Measuring the Newer Aspects of Functional Arithmetic. El. Sch. J. 47: 323-330; Feb. 1947.

Items from tests constructed by the author are presented with percentages of students at appropriate grade levels who answered correctly. Discussion of why items were easier or more difficult followed.

s; ---; 1-only; 900 students; 1.6; grs. 4-9; ---; ---; ---.

Traxler, Arthur E. Comparison of Scores on the Revised Edition and the Older Edition of the Stanford Achievement Test. El. Sch. J. 42: 616-620; Apr. 1942.

Little difference in grade equivalents of median scores on older and revised versions of the test was found.

r; ---; 1-only; 81 students; 1.3, 6.4; grs. 3-8; ---; norm; ---.

Traxler, Arthur E. and Selover, Margaret S. Relationship of Elementary-School Achievement Tests to Achievement Tests Taken in the Secondary School. J. Ed. Res. 36: 161-167; Nov. 1942. (f-2)

1) Correlations of arithmetic scores with algebra scores in grade 9 were .42 at grade 5, .50 at grade 6, .43 at grade 7, and .32 at grade 8. (These were lower than most of the language factor correlations.)

2) Correlations between arithmetic scores at grade 7 and mathematics achievement scores at grades 9, 10, and 11 were .43, .39, and .24.

3) Predictive validity for arithmetic scores was questionable.

r; ---; 2-s; 36 students; 6.4; grs. 5-9; ---; norm; ---.

Analysis and validation
of tests (f-1a)

Wright, E. Muriel J. Development of an Instrument for Studying Verbal Behaviors in a Secondary School Mathematics Classroom. *J. Exp. Ed.* 28: 103-121; Dec. 1959. (a-6)

The development of the instrument was described in detail, with data for varying types of observational uses tested. Systematic comparisons of teacher and student behaviors were possible with the instrument.

(I) type of procedure. (D) rating.

a; ---; 2-s; 15 classes; 1.1, 2.6, 3.4; grs. 9, 11; ---; ---; ---.

Other References

Bernstein, Jan. 1956	(e-1a)
Billig, 1944	(a-6)
Caldwell, Schrader, Michael, & Meyers, 1970	(f-2c)
Fenstermacher & Swineford, 1958	(t-1a)
Flournoy, 1964	(c-2)
Flournoy, Brandt, & McGregor, 1963	(c-14)
Grossnickle, 1944	(c-5)
Kennedy, J. W., 1963	(t-1b)
Lemmer, 1930	(d-8)
Olander, C. E., 1957	(c-9)
Orleans, J. B., Apr. 1934, May 1934	(f-2c)
Paige, 1966	(g-6a)
Rosen & Stolurow, 1964	(g-4)
Russell, I. L., 1969	(g-5)
Sawin, 1951	(g-5)
Sprague, 1939	(e-1b)

Status testing (f-1b)

Anderson, Kenneth E. and Dixon, Lyle J. A Study of the "Double Track" Program of Mathematics in the Secondary Schools of Kansas. Sch. Sci. Math. 52: 637-640; Nov. 1952. (a-3, c-21, c-22)

No significant difference was found between twelfth graders who had had either algebra or general mathematics in grade 9.

(I) algebra or general mathematics course in grade 9. (D) achievement in grade 12.

f; ---; 2-s; 46 students; 1.1, 3.2, 3.5; gr. 12; ---; norm; ---.

Boss, Mabel E. Arithmetic, Then and Now. Sch. & Soc. 51: 391-392; Mar. 23, 1940.

Throughout the grades, median scores of students who took a test in 1938 were lower than those who took the same test in 1916. The differing school population was cited as a possible reason.

s; ---; 2-s; 919 students; 1.3; grs. 3-8; ---; norm; ---.

Brown, G. W. Improving Instruction in Problem Solving in Ninth Grade General Mathematics. Sch. Sci. Math. 64: 341-346; May 1964. (a-5b, c-20, c-21)

Students made little gain on computation and problem solving tests; the percentage of students who did not show gains in grade 9 (25-31%) was greater than in grade 7 (5-10%) or 8 (17-18%).

(I) problem-solving aid. (D) achievement.

a; ---; 1-only; 12 classes (247 students); 1.4, 1.6; grs. 7-9;

1 yr.; norm, non-norm; ---.

Cramer, John Francis. Australian Tests and American Pupils. El. Sch. J. 37: 17-24; Sept. 1936. (a-7)

American students taking an Australian arithmetic test achieved higher median scores in grades 4 and 5 than some groups of Australian students, but lower medians resulted in grades 6 through 8.

s; ---; 1-only; 1000 students; 1.1, 1.3; grs. 5-8; ---; norm; ---.

Greenfeld, Norman and Finkelstein, Elsie L. A Comparison of the Characteristics of Junior High School Students. J. Genet. Psychol. 117: 37-50; Sept. 1970. (ERIC Document No. EJ 026 325) (a-6)

Students tested in 1930-35 scored higher in arithmetic--but on different tests from those used by the 1960's group. Mathematics was both "most liked" and "most disliked".

(I) year of testing. (D) achievement; interest.

f; ---; 1-only; 461 students; 1.3; grs. 7-9; ---; norm; ---.

Gundlach, W. B. Ability of High School Pupils in Common Fractions. J. Ed. Res. 29: 347-353; Jan. 1936. (c-4)

There appeared to be a slight growth from grade 7 to grade 12 in ability in all processes except division of fractions.

s; ---; 1-only; 623 students; 1.4; grs. 7-12; ---; ---; ---.

Hightower, Howard W. Individual Differences. Ed. Adm. & Sup. 41: 458-461; Dec. 1955. (e-1)

Of seven subtests, the narrowest range of scores was found in arithmetic computation--3.6 to 12.1. The range for arithmetic reasoning was from 3.4 to 12.0. The author made a plea to provide for such ranges.

s; ---; 1-only; 307 students; 1.1, 1.6; gr. 7; ---; norm; ---.

Johnson, J. T. An Evaluation of Research on Gradation in the Field of Arithmetic. J. Ed. Res. 37: 161-173; Nov. 1943. (b-5)

For the two-year period after the Chicago course of study (which shifted topics upward in accord with the Committee of Seven recommendations) was in use, tests showed a gain in improvement throughout grades 3B to 8A of over 21.2 per cent. This was a gain of 24.4 per cent in grades 3 and 4; 13.6 per cent in grades 5 and 6; and 25.4 per cent in grades 7 and 8.

s; ---; 1-only; 75,000 students; 1.1, 1.3, 1.6; grs. 3-8; 2 yrs.;

norm; ---.

Status testing (f-1b)

Johnson, John T. Can Concepts in Elementary Mathematics Be Developed? Sch. Sci. Math. 44: 146-154; Feb. 1944. (b-4)

1) From data from a test being developed, it appeared that the fraction and decimal concept was only about 40 per cent developed throughout grades 5 to 8. As mental age increased, scores improved.
2) The number and percentage of errors on common fractions and decimals were presented.

s; ---; 1-only; 502 students; 1.1, 1.6; grs. 6-8; ---; ---; ---.

Lindquist, E. F. The Gap Between Promise and Fulfillment in Ninth-Grade Algebra. Sch. R. 42: 762-771; Dec. 1934. (c-22)

Only ten of 62 items on the Iowa test (1933) were answered correctly by more than half of the students; only two items were answered correctly by more than three-fourths of the group.

s; ---; 1-only; 9034 students; 1.6; gr. 9; ---; norm; ---.

Mahin, Albert R. Do We Need Refresher Mathematics? Sch. Sci. Math. 46: 471-479; May 1946. (e-2)

Survey tests revealed many students did not reach a criterion level of proficiency; a "refresher" course resulted in increased scores, though all did not reach the criterion.

(I) remedial course. (D) achievement.

a; ---; 2-s; 288 students; ---; gr. 12; 1 semester; norm; ---.

Murphy, George M. Arithmetics Anonymous (An Analysis of Computational Mathematical Achievement in Six Towns). Aug. 5, 1968. (ERIC Document No. ED 033 769) (c-3)

Data on achievement of computational skills were presented.

s; ---; 1-only; ---; ---; grs. 1-12; ---; norm; ---.

Nelson, Theodora. Results of General Mathematics Tests. Arith. Teach. 3: 21-26; Feb. 1956. (c-21, e-1a)

Many items on a general mathematics test were achieved by fewer than 50 per cent of students in a mathematics contest.

s; ---; 1-only; 476 students; 1.6; gr. 9; 5 yrs.; non-norm; ---.

Randall, Rogers E. A Study of the Performance of Selected Pupils in General Mathematics in Negro High Schools of Louisiana. Sch. Sci. Math. 53: 552-554; Oct. 1953. (c-21, e-5)

Mean scores on a test of arithmetic, algebra, and word problems were below the 50 per cent level for "good" students beginning a general mathematics course.

s; ---; 2-s; 164 students; 1.4, 1.6, 1.10; gr. 9; ---; non-norm; ---.

Renner, John W. Student Achievement of Functional Competence Three Years After Completing Algebra or General Mathematics. Math. Teach. 50: 160-161; Feb. 1957. (c-20, c-21, c-22)

Twelfth graders who had studied only algebra had significantly higher scores on a test of functional competence than twelfth graders who had studied only general mathematics.

(I) type of course. (D) achievement.

f; ---; 1-only; 1227 students; 1.6, 3.4, 3.5; gr. 12; ---; norm; ---.

Stoneking, Lewis W. and Welch, Ronald C. Teachers' and Students' Understanding of Arithmetic. Ind. U. Sch. Ed. B. 37: 1-56; Sept. 1961. (t-1a, t-2a)

Understanding was found to increase between grades 8 and 12. Teachers with less than three years of experience scored higher than those with more experience, but student teachers scored higher than teachers, and twelfth graders scored higher than student teachers.

Status testing (f-1b)

s; ---; 1-only; 1066 students and teachers; 1.4, 3.2, 3.4; grs. 8-12, pre- and in-service; ---; non-norm; ---.

Welton, P. L. A Testing Program in Elementary Algebra and Its Evaluation. *Math. Teach.* 24: 69-75; Feb. 1931. (a-2, c-22)

A test emphasizing functional relationships was presented; the median score was 73 per cent.

s; ---; 1-only; 274 students (10 classes); 1.3, 1.6; gr. 9; ---; ---; ---.

Other References

Arthur, 1950	(e-1a)
Challman, 1946	(g-2)
Dutton & Blum, 1968	(a-6)
Glennon, 1949	(b-4)
Glennon, Winter 1949	(b-4)
Hilton & Myers, 1967	(f-2c)
Johnson, J. T., 1941	(b-5)
Kanarik & Manwiller, 1937	(e-1a)
Postlethwaite, (Ed.), 1969	(r-2)
Renner, 1955	(b-3)
Sato, 1968	(a-7)
Spaney, 1941	(t-2a)
Stewart, 1967	(e-5)
Stone, C. A., 1937	(b-5)

Alkire, G. Don. Functional Competence in Mathematics. J. Exp. Ed. 22: 227-236; Mar. 1954. (c-20, e-6)

It was found that a student was significantly more functionally competent in mathematics if he were: a boy, from a rural elementary school, planned to attend college, had taken more than two years of mathematics, and was in the upper quartile for GPA.

(I) type of background. (D) achievement.

f; ---; 2-r; 30 schools; 1.6, 2.6, 2.9, 3.2, 3.5, 3.19, 6.4; sec.;

---; norm; ---.

Bauernfeind, Robert H. and Blumenfeld, Warren S. A Comparison of Achievement Scores of Public-School and Catholic-School Pupils. Ed. & Psychol. Meas. 23: 331-336; Summer 1963.

Students in Catholic schools scored significantly higher on a standardized placement test in arithmetic than did students in public schools.

(I) type of school. (D) achievement.

f; ---; 2-s; 360,000 students; 1.4, 3.4; gr. 8; ---; norm; ---.

Beckmann, Milton W. How Mathematically Literate is the Typical Ninth Grader After Having Completed Either General Mathematics or Algebra? Sch. Sci. Math. 52: 449-455; June 1952. (c-21, c-22)

Students in both general mathematics and algebra attained a competence mastery level of only 50 per cent. Low gains were found between pre- and posttests.

(I) algebra or general mathematics course. (D) functional competency.

f; ---; 2-s; 1296 students; 1.4, 1.6; gr. 9; 1 yr.; non-norm; ---.

Achievement evaluation (f-2)

Beckmann, Milton W. Ninth Grade Mathematical Competence--15 Years Ago and Now. Sch. Sci. Math. 69: 315-319; Apr. 1969. (ERIC Document No. EJ 001 822) (a-1)

Students at the beginning of ninth grade in 1965 scored as well as those at the end of ninth grade in 1951. Comparable increases in scores were made by all types of students. Modern algebra improved basic competencies more than traditional algebra.

(I) type of background. (D) achievement.

f; ---; 1-only; 1385 students; 1.4; gr. 9; ---; non-norm; ---.

Beckmann, Milton William. Eighth Grade Mathematical Competence--15 Years Ago and Now. Arith. Teach. 17: 334-335; Apr. 1970. (ERIC Document No. EJ 019 327)

Mean score on a 109-item test was 45.7 in 1951, and 54.9 in 1965; the difference is statistically significant.

f; ---; 2-s; 40 schools (1951--1296 students, 1965--1385 students);

1.4, 1.5, 3.4; gr. 9; ---; ---; ---.

Berlin, Sol. Probable Causes for Failure in Plane Geometry I in Townsend Harris Hall. High Points 14: 28-36; Mar. 1932. (c-23)

Differences between students in two schools, in which 30 to 40 per cent had failed geometry, were analyzed. It was concluded that the students must be made to work harder.

s; ---; 2-r; 357 students; ---; gr. 10; ---; ---; ---.

Butler, Charles Henry. Mastery of Certain Mathematical Concepts by Pupils at the Junior High School Level. Math. Teach. 25: 117-172; Mar. 1932. (f-2a)

The extent to which 63 concepts and various subgroups of concepts had been mastered by various groups was tested, and the relationship to age was ascertained. Students were found to complete grade 7 with about one-third of the concepts mastered and to complete grade 9 with about two-thirds mastered.

s; ---; 2-s; 1658 students; 1.1, 1.3, 1.4, 1.6, 1.8, 1.9, 3.15;

grs. 7-9; ---; non-norm; ---.

Cain, Ralph W. Relationships of Verbal Reasoning and Numerical Ability to Achievement in First-Year Algebra. Sch. Sci. Math. 66: 131-134; Feb. 1966. (c-22, d-8)

For biology students, correlations between a numerical ability test and algebra grades were significantly higher than correlations between grades and verbal reasoning scores.

r; ---; 1-only; 5 schools; 3.4, 6.4; sec.; ---; norm; ---.

Christofferson, H. C. The Crucial Place of Seventh and Eighth Grade Mathematics in Education for Competency. Sch. Sci. Math. 41: 55-62; Jan. 1941.

Examples of the types of problems which varying percentages of students could do accurately were presented.

s; ---; 1-only; 16,300 students; 1.6; grs. 7, 8; ---; norm; ---.

Coffing, Esther A. The Relationship Between Silent Reading Ability and Arithmetical Ability. Sch. Sci. Math. 41: 10-14; Jan. 1941. (d-7)

A positive relationship between scores made in paragraph meaning and arithmetic reasoning was found. The pattern was inconsistent, ranging from .08 to .77, with six of ten correlations over .50.

r; ---; 1-only; 355 students; 1.1, 1.4, 1.8, 6.4; grs. 4-8; ---;

norm; ---.

Frankel, Edward. A Comparative Study of Achieving and Underachieving High School Boys of High Intellectual Ability. J. Ed. Res. 53: 172-180; Jan. 1960. (e-2a, e-3)

Although previous arithmetic achievement was one of the bases for matching, achievers were found to be distinctly superior to underachievers in mathematical aptitude.

(I) achievement level. (D) aptitude; other background variables.

f; ---; 2-s, 3-m; 100 boys; 2.6, 3.4; gr. 12; ---; norm; ---.

Achievement evaluation (f-2)

Grossnickle, Foster E. Comparison of Achievement of Pupils Who Are Good and Poor in Learning Division with a Two-Figure Divisor. J. Ed. Res. 34: 346-351; Jan. 1941. (c-3d)

Good achievers made no more than five types of errors, while 18 types were listed for poor achievers. Good and poor achievers did not differ significantly in intelligence. Mean differences between good and poor achievers were significant on the first test, but after a period of drill plus diagnosis of errors, differences were not significant. On the whole, as students progressed from fourth to ninth grade, mean differences in marks, achieved by the good and poor achievers in division, decreased.

s; ---; 1-only; 94 students; 1.1, 1.4, 1.5, 3.17; grs. 4-9; ---;

norm; ---.

Hildreth, Gertrude. Results of Repeated Measurement of Pupil Achievement. J. Ed. Psychol. 21: 286-296; Apr. 1930.

1) Medians for group growth curves indicated more rapid acceleration in reading than in arithmetic and spelling.
2) Individual growth curves for seven students indicated significant differences in rate of growth, but little difference in the nature of the curve. Three who ranked highest, lowest, and median on the initial reading test maintained rank position in all subject areas, though this was not true for other students.
3) Correlations for initial and final scores were positive, but not high enough for predictions.

s; ---; 1-only; 96 students; 1.3, 1.6, 6.4; grs. 2-8; ---; norm;

---.

Hobson, J. R. Physical Growth and School Achievement of Adolescence. Harvard Ed. R. 5: 154-164; June 1935.

Rapidity of growth and weight was found to bear no significant relationship to gains in arithmetic or reading achievement scores for either boys or girls in adolescence.

r; ---; 2-s; 400 students; 3.17, 6.4; ages 11-14; 2 yrs.; norm; ---.

Hutson, Percival W. and Webster, Arthur D. An Experiment in the Educational and Vocational Guidance of Tenth-Grade Pupils. Ed. & Psychol. Meas. 3: 3-21; Spring 1943.

A guidance program was found to help students; algebra scores were higher for tenth graders given guidance than for eleventh graders not given guidance.

(I) guidance program. (D) achievement.

a; ---; 2-s; 471 students; 1.6; grs. 10, 11; 1 yr.; norm; ---.

Joseph, Margaret. The Factor of Interest in the Teaching of Mathematics. Sch. Sci. Math. 40: 201-207; Mar. 1940.

All students who failed in algebra and geometry ranked in the lowest half of their class, with 70 per cent in the lowest quarter.

s; ---; 1-only; 598 students; 1.6, 1.9; grs. 10-12; ---; ---; ---.

Justman, Joseph and Forlano, George. The Performance of Academic and Vocational High School Pupils on the Cooperative Mathematics Test. Math. Teach. 45: 267-268; Apr. 1952.

Students from academic schools had slightly superior scores than comparable students from vocational schools; scores on the appreciation subtest were significantly different.

(I) academic or vocational school. (D) achievement.

f; ---; 2-m; 380 students; 1.4, 3.4; gr. 8; ---; norm; ---.

Keys, Noel and Lawson, J. V. Summer Versus Winter Gains in School Achievement. Sch. & Soc. 46: 541-544; Oct. 23, 1937.

Losses over the summer were significant for both arithmetic operations and problems. These losses were greater than those for any other subject, while gains during the winter months were higher. Significant losses as great or greater occurred in other "drilled abilities" subjects.

(I) summer or winter term. (D) achievement.

f; ---; 2-s; 164 students; 1.5, 1.6, 1.12, 3.15; grs. 4-8; 3 yrs.;

norm; ---.

Achievement evaluation (f-2)

Lee, Dorris May and Lee, J. Murray. Some Relationships Between Algebra and Geometry. J. Ed. Psychol. 22: 551-560; Oct. 1931. (c-22, c-23)

Correlations between algebra and geometry aptitude test scores were from .55 to .62, while achievement test correlations were from .41 to .70.

r; ---; 1-only; 181 students; 1.4, 1.6, 3.15, 6.4; grs. 9, 10; ---;

norm, non-norm; ---.

Merenda, P. F. and Jackson, R. M. Relationship Between Fourth-Grade and Seventh-Grade Performance on the Iowa Tests of Basic Skills. J. Ed. Meas. 5: 163-165; 1968.

Seventh grade arithmetic scores correlated highly (.70) with fourth grade arithmetic scores.

r; ---; 2-s; 900 students; 1.4, 6.4; grs. 4, 7; ---; norm; ---.

Millman, Jason and Johnson, Mauritz, Jr. Relation of Section Variance to Achievement Gains in English and Mathematics in Grades 7 and 8. Am. Ed. Res. J. 1: 47-51; Jan. 1964.

No relationship was found between gain scores and amount of variability of sections in which students were taught.

(I) type of section. (D) achievement.

f; ---; 1-only; 8000 students (327 classes); 1.5; grs. 7, 8; ---;

norm; ---.

Ohlsen, Merle M. Control of Fundamental Mathematical Skills and Concepts by High School Students. Math. Teach. 39: 365-371; Dec. 1946. (c-20, e-1a)

The average score on all items was 48.2 per cent; specific data were presented and discussed.

s; ---; 2-s; 43 schools; 1.4, 1.5; grs. 10-12; ---; non-norm; ---.

Rahn, Grant. A Redirected Emphasis on Individualized Mathematics for All. Sch. R. 51: 279-282; May 1943.

Even groups who had studied from two to four semesters of mathematics contained students with very low scores on a test of fundamental operations. Scores of those with more than two years of mathematics were relatively high.

s; ---; 1-only; 210 students; 1.3, 1.8; gr. 12; ---; ---; ---.

Salzinger, Kurt. Academic Achievement in a Group of Mentally Disturbed Adolescents in a Residential Treatment Setting. J. Genet. Psychol. 90: 239-253; June 1957. (e-5)

Arithmetic scores were lower than those for other tests.

r; ---; 1-only; 17 students; 3.2, 4.7, 6.4; ages 13-18; ---; ---; ---.

Schorling, Raleigh. The Need for Being Definite with Respect to Achievement Standards. Math. Teach. 24: 311-329; May 1931. (c-3)

There were only two tasks (of 100) that nine of ten eighth graders could do. There were only nine things to which as many as 80 per cent responded correctly; 24 items, 70 per cent; 56 items, 40 per cent. The median score at grade 5 was 17.6; at grade 6, 22.0; at grade 7, 39.8; at grade 8, 43.8; and by grade 12, only 67.0.

s; ---; 1-only; 3545 students; 1.3, 1.6, 1.8, 1.10; grs. 5-12; ---; ---; ---.

Stokes, C. N. Comparing the Effect of Arithmetic and General Mathematics Training in the Seventh and Eighth Grades Upon Achievement in Ninth-Grade General Mathematics. Sch. Sci. Math. 31: 853-857; Oct. 1931. (c-21)

The group that studied general mathematics in the seventh and eighth grades seemed to be superior to the group that studied arithmetic in achieving in general mathematics in the ninth grade.

(I) type of background. (D) achievement.

Achievement evaluation (f-2)

f; ---; 1-only; 194 students; 1.4, 2.1, 3.15; grs. 7-9; ---; norm; ---.

Sueltz, Ben A. Mathematical Understanding and Judgments Retained by College Freshmen. Math. Teach. 44: 13-19; Jan. 1951. (t-1a)

Weaknesses in the mathematical understandings of both teachers and students were found.

s; ---; 1-only; 3000 students; 1.6; grs. 7-9, pre-service; ---; non-norm; ---.

Traxler, Arthur E. Correlation of Achievement Scores and School Marks. Sch. R. 45: 776-780; Dec. 1937.

A median correlation of .69 was found between mathematics achievement test scores and school marks when IQ was held constant; it was higher than the correlation for other subjects and less changed by holding IQ constant. The highest correlations when reading was held constant were also for mathematics.

r; ---; 1-only; 8 boys' schools; 1.3, 6.4; sec.; ---; norm; ---.

Unkel, Esther. A Study of the Interaction of Socioeconomic Groups and Sex Factors with the Discrepancy Between Anticipated Achievement and Actual Achievement in Elementary School Mathematics. Arith. Teach. 13: 662-670; Dec. 1966. (e-6, e-7)

Statistical interactions of socioeconomic status and sex with the discrepancy between anticipated and actual achievement scores were investigated. Socioeconomic status was a significant factor in achievement of children of comparable mental ability. Fluctuation of discrepancy scores was greatest for arithmetic reasoning. Discrepancy scores of boys and girls followed approximately the same pattern, except for grade 6 to grade 9, when girls' discrepancy scores surpassed the boys'.

(I) socioeconomic level; sex. (D) difference between anticipated and actual achievement in arithmetic reasoning, fundamentals, and total.

f; ---; 2-r; 918 students; 3.2, 3.6; grs. 1-9; 3 wks.; norm; ---.

Very, Philip S. and Iacono, Carmine H. Differential Factor Structure of Seventh Grade Students. *J. Genet. Psychol.* 117: 239-251; Dec. 1970. (ERIC Document No. EJ 030 298) (e-6)

Analysis of data from a test battery revealed that numerical facility and perceptual speed were found to be a single factor at this age level. No inductive reasoning factor was present for girls, nor was symbolic reasoning or estimative ability found for boys. Arithmetic reasoning was found as predicted, but general reasoning was not.

r; ---; 1-only; 203 students; 3.4, 6.1; gr. 7; ---; norm; ---.

Other References

Armstrong & Heisler, 1945	(e-5)
Austin, G. R., 1969	(a-4)
Ayers, G. H., Dec. 1934	(f-2c)
Bloom, 1956	(f-1a)
Cassel & Jerman, 1963	(a-4)
Cawley & Goodman, 1968	(e-2c)
Christensen, 1968	(g-5)
Clem & Hovey, 1933	(e-5)
Coers, 1935	(e-5)
Conway & Nemzek, 1942	(e-5)
Easterday, 1964	(e-2a)
Fitzgerald, 1963	(b-4)
Flanders, 1948	(b-4)
French, 1962	(e-5)
Hildreth, 1938	(e-3)
Kvaraceus & Lanigan, 1948	(f-1a)
Lessing, Zagorin, & Nelson, 1970	(e-5)
Madden, 1968	(a-3)
Mann, Taylor, Proger, Dungan, & Tidey, 1970	(e-5)
Manuel, 1935	(e-5)
McGrath, 1937	(e-5)
Meder & Eagle, 1948	(r-2)
Moore, J. E., 1936	(e-5)
Osborne, 1960	(e-5)
Pitts, R. J., 1952	(d-7)
Romberg, 1969	(r-2)
Ruddell, 1962	(a-4)
Sackett, 1935	(e-5)
Sax & Ottina, 1958	(b-5)
Tracy, 1959	(a-7)
Traxler & Selover, 1942	(f-1a)
Upshall & Masters, 1934	(f-4)
Wiersma, 1967	(t-1a)
Williams, E. D. & Shuff, R. V., 1963	(d-9)

Achievement evaluation: Related to age (f-2a)

Holmes, Jack A. and Finley, Carmen J. Under- and Over-Age Grade-Placements and School Achievement. J. Ed. Psychol. 48: 447-456; Nov. 1957. (b-5)

1) Correlations among grade placement deviation (GPD) at grade 7 and 6 achievement subtest scores were presented. GPD correlated lowest with arithmetic fundamentals for boys (.259) and girls (.233). Correlations with arithmetic reasoning were .318 for boys and .278 for girls.

2) Correlations at grade 8 were GPD and arithmetic fundamentals, .327 for boys (lowest) and .298 for girls; GPD and arithmetic reasoning, .430 for boys and .302 for girls.

3) In summary, it was noted that arithmetic scores appeared to play almost no role in determining whether or not a student was retarded, promoted, or accelerated in the elementary school.

r; ---; 2-s; 1216 students; 6.6; grs. 7, 8; ---; norm; ---.

Messler, Dorothy L. A Study of Pupil Age and Achievement in Eighth-Grade Algebra. Math. Teach. 54: 561-564; Nov. 1961. (c-22, e-3b)

Students who took algebra in eighth-grade achieved and retained as well as a matched group of students who took algebra in grade 9.

(I) algebra in grade 8 or 9. (D) achievement; retention.

e; 3.21 r; 2-s, 3-m; 2 classes (68 students); 3.5; grs. 8, 9; 1 yr.

(retention, 2 mos.); norm; 23 (3, 2, 2, 3, 3, 3, 3, 2, 2).

Tsao, Fei. A Study of the Relationship Between Grade and Age and Variability. J. Exp. Ed. 12: 187-200; Mar. 1944. (f-1)

1) As part of an exploration of various statistical tests, an achievement test in arithmetic was given. Variability in scores appeared to increase with grade, but this was found to be merely a function of the test material itself and not representative of any true psychological situation. The relationship between arithmetic and language scores was positive but far from perfect.

2) Conclusions included a statement of the need to consider individual differences early, possibly by a non-graded technique.

r; ---; 1-only; 267 students (8 classes); 1.4, 6.4; grs. 5-8; ---;

norm; ---.

Other References

Butler, 1932	(f-2)
Cronin, 1967	(a-4)
Meyen & Hieronymus, 1970	(e-2c)
Sheehan, 1968	(e-6)

Achievement evaluation:
Related to intelligence (f-2b)

Farley, Eugene S.; Frey, Albin J.; and Garland, Gertrude. Factors Related to the Grade Progress of Pupils. El. Sch. J. 34: 186-193; Nov. 1933.

Correlations of .77 and .72 were found between mental ability and grade placement; .75 and .69 between IQ and grade placement; .72 and .79 between grade placement and arithmetic; .72 and .71, between grade placement and reading. Weight, attendance, health and socio-economic status correlated insignificantly.

r; ---; 1-only; 193 students; 1.3, 1.6, 6.4; age 12 in grs. 4-8;

---; norm; ---.

Hinkelman, Emmet. Relationship of Intelligence to Elementary School Achievement. Ed. Adm. & Sup. 40: 176-179; Mar. 1955.

1) Marks were significantly related to IQ scores in grades 2A, 3A, and 7A, in ten curricular areas in all three grades.

2) Correlations for IQ and arithmetic marks were .58 at grade 2, .60 at grade 5, and .67 at grade 7.

r; ---; 2-s, 3-s; 30 students; 5.2; grs. 2-7; ---; norm; ---.

Holowinsky, Ivan. The Relationship Between Intelligence (80-110 IQ) and Achievement in Basic Educational Skills. Training Sch. B. 58: 14-22; Feb. 1961.

1) No significant overall changes in arithmetic achievement were found either due to IQ or age factors. There were differences in correlations between arithmetic and IQ as a function of age. For the sample as a whole the correlation between arithmetic and IQ was .30. The correlation at age 12-13 was .59; 13-14, .39; 14-15, .54; others were non-significant.

2) There was no increase in average arithmetic achievement after 15 or 16 years of age.

3) The correlation between reading and arithmetic for the whole sample was .61.

4) Students of lower intellectual ability, regardless of age, tended to show better achievement in arithmetic than in reading.

5) There was a correlation of .31 between arithmetic achievement and grade placement.

r; ---; 2-r; 375 students; 1.4, 3.2, 3.3, 5.2, 6.4; ages 12-17;

---; norm; ---.

Hummer, Vivian L. A Comparison of I.Q. and Achievement in Plane Geometry. Sch. Sci. Math. 36: 496-501; May 1936. (c-23)

A significant positive correlation (.58) was found between IQ and a geometry test score.

r; ---; 2-s; 153 students (7 classes); 1.4, 1.5, 1.8, 6.4; gr. 10;

---; norm; ---.

Jacobs, James N. A Study of Performance of Slow Learners in the Cincinnati Public Schools on Mental and Achievement Tests. Am. J. Ment. Def. 62: 238-243; Sept. 1957. (e-2c)

Arithmetic achievement was higher than reading and language achievement.

s; ---; 1-only; 293 students; 1.4, 3.2, 3.3, 3.4, 6.4; ages 13-18;

---; norm; ---.

Kennedy, Wallace A.; Willcutt, Herman; and Smith, Alvin. Wechsler Profiles of Mathematically Gifted Adolescents. Psychol. Reports 12: 259-262; Feb. 1963.

Students whose mean IQ was 135 were found to be higher on the Verbal scale than on the Performance scale.

r; ---; 1-only; 130 students; 6.4; sec.; ---; norm; ---.

Klein, Adolph. Arithmetic Reasoning, I.Q.'s, and Accounting. High Points 14: 69-72; June 1932. (d-8)

Few accounting students attained grade-level scores on an arithmetic test; a wide range in IQ was found.

s; ---; 1-only; 69 students; 1.1, 1.3, 1.6; ages 14-19; ---; norm;

---.

Achievement evaluation: Related to intelligence (f-2b)

Richardson, Helen M. and Surko, Elise F. WISC Scores and Status in Reading and Arithmetic of Delinquent Children. *J. Genet. Psychol.* 89: 251-262; Dec. 1956. (e-5)

Differences between arithmetic achievement test scores and IQ subtest scores were significant; the delinquent children tested were not achieving as well as could be expected.

s; ---; 1-only; 65 students; 1.4, 3.4; ages 8-18; ---; norm; ---.

Rosilda, Sister M. Is I.Q. an Index to Algebraic Ability? *J. Ed. Res.* 44: 391-393; Jan. 1951. (c-22)

A correlation of .42 was found between IQ and algebra test scores.

r; ---; 1-only; 635 students; 1.6, 1.10, 6.4; gr. 9; ---; norm; ---.

Other References

Alexander, A. M., 1953	(f-4)
Baldauf, 1959	(e-3b)
Belcastro, Jan. 1966	(a-4)
Burgert, 1935	(e-6)
Campbell, *et al.*, 1963	(g-5)
Cronin, 1967	(a-4)
Douglass & Campbell, 1936	(e-2a)
Durr, 1958	(d-2)
Fitzgerald, 1965	(a-4)
Foran & O'Hara, 1935	(e-6)
Giles, 1964	(f-1a)
Graubard, 1964	(e-5)
Hughes & Nelson, 1963	(g-6b)
Jamison, 1964	(d-3)
Jerome, 1959	(e-2b)
McBee & Duke, 1960	(f-1a)
Richter, 1934	(f-2c)
Saunders, 1960	(f-1a)
Schane, 1938	(c-4)
Seagoe, 1938	(f-2c)
Washburne, 1931	(b-5)
Wolking, 1955	(f-2c)

Ayers, G. H. Predicting Success in Algebra. Sch. & Soc. 39: 17-18; Jan. 1934. (c-22)

Correlations of 19 measures with success in algebra were presented. A prognosis test, a reasoning test, and a teacher estimate were the best combination for prediction.

r; ---; 2-s; 240 students; 6.4; gr. 9; ---; non-norm; ---.

Ayers, G. H. An Exploratory Course in Mathematics. J. Appl. Psychol. 18: 843-847; Dec. 1934. (a-4, c-22, f-2)

Students who were advised to take algebra or general mathematics on the basis of a combination of prediction factors after an eighth grade exploratory course generally failed less than those who took algebra when advised not to.

r; ---; 1-only; 338 students; 1.6, 6.3, 6.4; grs. 8, 9; 6-9 wks.;

---; ---.

Baldauf, Robert J. Predicting Success in Eighth Grade Algebra. Psychol. Reports 12: 810; June 1963. (c-22)

A mental maturity test was found to predict success almost as effectively when used alone as when used with an aptitude test.

r; ---; 1-only; 160 students; 6.4; grs. 7, 8; ---; norm; ---.

Barnes, Ward Ewing and Asher, John William. Predicting Students' Success in First-Year Algebra. Math. Teach. 55: 651-654; Dec. 1962. (c-22)

The best single predictor of success in algebra was the eighth grade mathematics mark (.59).

r; ---; ---; 192 students; 1.4, 3.13, 6.3, 6.4; gr. 9; ---; ---;

---.

Achievement evaluation:
Related to prediction (f-2c)

Blick, David J. and Braman, Shirley E. Some Practices Used in Counseling Students Prior to Enrollment in Elementary Algebra and Plane Geometry. Sch. Sci. Math. 54: 107-115; Feb. 1954. (c-22, c-23)

Twenty-four counseling practices were tabulated for algebra and 21 for geometry. Marks and teacher estimates were used most frequently, with IQ and achievement scores also widely used.

s; ---; ---; 132 schools; 1.1, 1.6; grs. 7-12; ---; ---; ---.

Braverman, Benjamin. Does a Year's Exposure to Algebra Improve a Pupil's Ability in Arithmetic? Math. Teach. 32: 301-312; Nov. 1939. (c-10)

After analyzing available data, the conclusion was reached that arithmetic scores improved after an algebra course.

(I) course in algebra. (D) achievement.

f; ---; 2-s; 170-466 students; 1.1, 1.3, 1.4; gr. 9; 1 sch. yr.;

non-norm; ---.

Caldwell, James R.; Schrader, Donald R.; Michael, William B.; and Meyers, C. E. Structure-of-Intellect Measures and Other Tests as Predictors of Success in Tenth-Grade Modern Geometry. Ed. & Psychol. Meas. 30: 437-441; Summer 1970. (ERIC Document No. EJ 024 320) (c-23, f-1a)

Two structure-of-intellect tests were found to be valid predictors of geometry achievement.

r; ---; 1-only; 322 students; 6.2, 6.3; gr. 10; ---; norm; ---.

Clifton, L. L. Prediction of High School Marks in Elementary Algebra. J. Exp. Ed. 8: 410-413; June 1940. (c-22)

A formula based on achievement and IQ scores was found to predict algebra success with some accuracy (especially for groups).

r; ---; 2-s; 271 students; 1.6, 6.2, 6.3, 6.4; gr. 9; ---; norm;

---.

Cooke, Dennis H. and Pearson, John M. Predicting Achievement in Plane Geometry. Sch. Sci. Math. 33: 872-878; Nov. 1933. (c-23)

No one of three measures was found to be an accurate predictor of success in geometry.

r; ---; 1-only; 195 students; 6.2, 6.3, 6.4; gr. 10; ---; norm; ---.

Coyle, Paul J. A Study of the Predictive Validity of the Sequential Tests of Educational Progress. J. Sch. Psychol. 5: 317-318; Sept. 1967.

The best predictor of the STEP tests at grade 8 for sophomore grades was found to be the mathematics scores (r = .50).

r; ---; 2-s; 132 students; ---; grs. 8, 10; 3 yrs.; norm; ---.

Davis, Robert A. and Henrick, Marguerite. Predicting Accomplishment in Plane Geometry. Sch. Sci. Math. 45: 403-405; May 1945. (c-23)

A test, algebra marks, and IQ were each found to be predictors of achievement in geometry.

r; ---; 2-s; 38 students; 6.4; grs. 10-12; ---; norm, non-norm; ---.

Dickter, M. Richard. Predicting Algebraic Ability. Sch. R. 41: 604-606; Oct. 1933. (c-22)

Teachers' marks in eighth-grade mathematics and a specified test were found to be the best predictors of algebra ability.

r; ---; 1-only; 83 students; 6.4; gr. 9; ---; norm; ---.

Dunn, William Hudson. The Influence of the Teacher Factor in Predicting Success in Ninth Grade Algebra. J. Ed. Res. 30: 577-582; Apr. 1937. (c-22, f-4, t-2d)

Intercorrelations of predictive factors were higher when computed for the classes of one selected teacher than when computed for classes of several teachers.

r; ---; 2-s, 3-s; 223 students; 6.2, 6.3, 6.4; gr. 9; ---; norm;

---.

Achievement evaluation:
Related to prediction (f-2c)

Feldhusen, John F.; Treffinger, Donald J.; and Elias, Robert M. Prediction of Academic Achievement with Divergent and Convergent Thinking and Personality Variables. Psychol. in Sch. 7: 46-52; Jan. 1970. (ERIC Document No. EJ 014 531) (e-6)

Predictor variables for mathematics scores were ascertained and discussed; they differed for boys and girls.

r; ---; 2-s; 97 students; 6.3; gr. 12; ---; norm, non-norm; ---.

Goddeyne, Sister Loretta Marie and Nemzek, Claude L. The Comparative Value of Two Geometry Prognosis Tests in Predicting Success in Plane Geometry. J. Soc. Psychol. 20: 283-287; Nov. 1944. (c-23)

Lee test scores predicted geometry success better than Orleans test scores and IQ scores.

r; ---; 1-only; 164 students; 1.4, 6.4; gr. 10; ---; norm; ---.

Greenspan, Philip. Predicting Success in Algebra. High Points 35: 19-22; May 1953. (c-22)

A specified test score plus an IQ of 90 did not necessarily indicate a high probability for success in algebra.

s; ---; 1-only; 193 students; 1.1; gr. 9; ---; norm; ---.

Grime, H. E. Aptitude and Ability in Elementary Algebra. Sch. Sci. Math. 47: 781-784; Dec. 1947. (c-22)

A correlation of .70 was found between an aptitude test and achievement in algebra.

r; ---; 1-only; 2615 students; 6.4; gr. 9; ---; ---; ---.

Grover, C. C. Results of an Experiment in Predicting Success in First Year Algebra in Two Oakland Junior High Schools. J. Ed. Psychol. 23: 309-314; Apr. 1932. (c-22)

A correlation of .61 was found between a prognostic test and an achievement test.

r; ---; 1-only; 100 students; 1.1, 6.3, 6.4; gr. 9; ---; norm; ---.

Guiler, W. S. Forecasting Achievement in Elementary Algebra. J. Ed. Res. 38: 25-33; Sept. 1944. (c-22)

The combination of algebra aptitude and computational arithmetic scores appeared to be the best predictor of algebra achievement.

r; ---; 1-only; 75 students; 1.6, 6.3, 6.4; gr. 9; ---; norm; ---.

Guilford, J. P.; Hoepfner, Ralph; and Peterson, Hugh. Predicting Achievement in Ninth-Grade Mathematics from Measures of Intellectual-Aptitude Factors. Ed. & Psychol. Meas. 25: 659-682; Fall 1965. (c-21, c-22)

Batteries of factor scores were better predictors of achievement than two standard test combinations, and increased prediction when added to each of three test predictions, especially for algebra. Combination of factor-test scores discriminated successfully between general mathematics and algebra students.

r; ---; 1-only; 428 students; 3.3, 3.13, 6.1, 6.2, 6.4; gr. 9; ---;

norm; ---.

Hanna, Gerald S. An Attempt to Validate Standard Kuder Scales and an Empirically-Derived Interest Scale for Predicting Success in High School Geometry. Ed. & Psychol. Meas. 26: 445-448; Summer 1966. (c-23)

Neither standard nor empirically derived Kuder scales contributed significantly to multiple regression prediction of geometry success.

r; ---; 2-r; 94 students; 6.3; gr. 10; ---; norm; ---.

Hanna, Gerald S. The Use of Students' Predictions of Success in Geometry and Year of High School to Augment Predictions Made from Test Scores and Past Grades. J. Ed. Meas. 4: 137-141; Fall 1967. (c-23)

Predictive levels increased slightly as factors such as student predictions were considered with scores and grades.

r; ---; 1-only; 202 students; 1.4, 6.2; gr. 10; ---; norm, non-

norm; ---.

Achievement evaluation:
Related to prediction (f-2c)

Hanna, Gerald S.; Bligh, Harold F.; and Lenke, Joanne M. Student-Reported Grades as Predictors. Personnel & Guid. J. 48: 465-468; Feb. 1970. (ERIC Document No. EJ 014 512) (c-21, c-22)

Student-reported grades were as valid as school-reported grades in predicting criteria of algebra success, but were slightly less valid for geometry.

r; ---; 1-only; 1519 students; 6.4; grs. 8-10; ---; norm, non-norm; ---.

Hanna, Gerald S.; Bligh, Harold F.; Lenke, Joanne M.; and Orleans, Joseph B. Predicting Algebra Achievement with an Algebra Prognosis Test, IQs, Teacher Predictions, and Mathematics Grades. Ed. & Psychol. Meas. 29: 903-907; Winter 1969. (ERIC Document No. EJ 014 097) (c-21)

A prognosis test was effective in predicting achievement; correlations for other measures were also presented.

r; ---; 1-only; 1105 students; 3.13, 6.2, 6.4; gr. 8; ---; norm; ---.

Hanna, Gerald S. and Lenke, Joanne M. Moderator Variables in Predicting Geometry Success. Sch. Sci. Math. 70: 299-302; Apr. 1970. (ERIC Document No. EJ 019 971) (c-23)

Neither sex nor the realism of student-predicted grades in relation to actual grades effectively predicted success in geometry. Predictions were better for students whose self-reported grades were less variable.

r; ---; 2-s; 481 students; 2.6; gr. 10; ---; non-norm; ---.

Hilton, Thomas L. and Myers, Albert E. Personal Background, Experience and School Achievement: An Investigation of the Contribution of Questionnaire Data to Academic Prediction. J. Ed. Meas. 4: 69-80; Summer 1967. (e-5, f-1b)

Nine biographical factors accounted for 35 per cent of the variance for prediction scores in mathematics; test scores were more effective as predictors.

r; ---; 2-s; 1206 boys; 1.4, 3.13, 6.1, 6.2, 6.4; grs. 11, 12; ---; norm; ---.

Ivanoff, John M.; DeWane, Evermode T.; and Praem, O. Use of Discriminant Analysis for Selecting Students for Ninth-Grade Algebra or General Mathematics. Math. Teach. 58: 412-416; May 1965. (c-21, c-22)

A procedure for predicting success in algebra was presented.

r; ---; ---; 448 boys; 3.10; gr. 9; ---; ---; ---.

Kamii, Constance K. and Weikart, David P. Marks, Achievement, and Intelligence of Seventh Graders Who Were Retained (Non-Promoted) Once in Elementary School. J. Ed. Res. 56: 452-459; May/June 1963. (g-5)

The groups who had been retained had lower arithmetic scores in grade seven than the group who had not been retained.

(I) six or seven years in elementary school. (D) achievement.

f; ---; 2-s; 62 students; 1.1, 1.6, 3.4; gr. 7; ---; norm; ---.

Kertes, Ferdinand. Ability Grouping in the High School. Math. Teach. 25: 5-16; Jan. 1932. (c-22, e-4)

Normal distributions of IQ scores, English marks, and algebra prognosis scores were found, but arithmetic marks tended to be lower, and were the best single factor for grouping in algebra. Use of the Orleans Test in addition to marks increased prediction correlations.

s; ---; 1-only; 383 students; 1.1, 1.6, 6.4; gr. 9; ---; ---; ---.

Layton, R. B. A Study of Prognosis in High School Algebra. J. Ed. Res. 34: 601-605; Apr. 1941. (c-22)

A study relating to prediction of success in algebra in a local school system was presented.

r; ---; ---; ---; ---; gr. 9; ---; ---; ---.

Achievement evaluation:
Related to prediction (f-2c)

Lee, J. Murray and Hughes, W. Hardin. Predicting Success in Algebra and Geometry. Sch. R. 42: 188-196; Mar. 1934. (c-22, c-23)

Aptitude tests provided the best single prediction of achievement test scores in both algebra and geometry, with an IQ test second best. Teacher judgment was the best predictor of grades.

r; ---; ---; 338 students; 6.4; grs. 9, 10; ---; norm; ---.

MacArthur, R. S. and Mosychuk, H. Lower and Upper Socioeconomic Group Contrasts in Long-Term Predictability of Grade Nine Achievement. J. Ed. Meas. 3: 167-168; Summer 1966. (e-7)

The predictability of ninth grade achievement from grades 6-7 scores was higher for the upper SES group. No differences were found for scores from grade 3.

r; ---; 1-only; 148 students; 1.3, 4.1, 6.4; grs. 3, 6-7, 9; ---;

---; ---.

McCuen, Theron L. 'Predicting Success in Algebra. J. Ed. Res. 21: 72-74; Jan. 1930. (c-22)

An IQ test was found to be the best predictor of success in algebra, but there were too many unmeasurable factors to permit accurate predictions.

r; ---; ---; 116 students; 6.4; gr. 9; ---; norm; ---.

McQueen, Robert and Williams, Kenneth C. Predicting Success in Beginning High School Algebra. Psychol. Reports 4: 603-606; Dec. 1958. (c-22)

Significant correlations were found between eighth year arithmetic grades and algebra grades (.63) and algebra prognosis test scores and algebra grades (.41). Correlations between algebra grades and reading or mental ability were not significant.

r; ---; 2-s; 83 students; 1.4, 6.4; gr. 9; ---; norm; ---.

Orleans, Joseph B. A Study of Prognosis of Probable Success in Algebra and in Geometry. Math. Teach. 27: 165-180, Apr. 1934; 225-246, May 1934. (c-22, c-23, f-1a)

Previous studies on prognosis were discussed and data on the development of the Orleans Test presented.

r; ---; 1-only; ---; 6.2, 6.3, 6.4; grs. 9, 10; ---; ---; ---.

Osburn, H. G. and Melton, R. S. Prediction of Proficiency in a Modern and Traditional Course in Beginning Algebra. Ed. & Psychol. Meas. 23: 277-287; Summer 1963. (c-22)

Aptitude tests were found to be equally valid in predicting proficiency in modern and traditional courses. Spatial and mechanical reasoning tests were more valid for the modern than for the traditional course.

r; ---; ---; 155 students; 6.4; gr. 9; ---; norm, non-norm; ---.

Perry, Winona M. Prognosis of Abilities to Solve Exercises in Geometry. J. Ed. Psychol. 22: 604-609; Nov. 1931. (c-23)

Comparison of Perry's and Orleans' tests led to the conclusion that Perry's, based on analysis of requisite abilities, was the more efficient.

r; ---; 1-only; 42 students (2 classes); 2.2, 6.4; gr. 10; ---;

non-norm; ---.

Richardson, H. D. Predicting Achievement in Plane Geometry. Math. Teach. 28: 310-319; May 1935. (c-23)

Second semester algebra grades and geometry prognostic test scores were found to be the best predictors of geometry achievement.

r; ---; 1-only; 135 students; 1.1, 6.2, 6.3, 6.4; gr. 10; ---;

norm; ---.

Achievement evaluation:
Related to prediction (f-2c)

Richter, Rose. The Predictive Value of IQ's for Success in Algebra. High Points 16: 45-48; Oct. 1934. (c-22, f-2b)

The correlation between IQ and algebra average was .30. When "extreme cases" were omitted, those with low IQ's achieved about as well as those with higher IQ's.

r; ---; 1-only; 161 students; 1.3, 1.4, 1.6, 6.4; gr. 9; ---; ---;

---.

Ross, C. C. and Hooks, N. T. How Shall We Predict High School Achievement? J. Ed. Res. 22: 184-196; Oct. 1930.

Grade school scores for mathematics were found to have correlations of .42 to .51 with achievement in grade 9 mathematics.

r; ---; 1-only; 700 students; 6.4; gr. 9; ---; ---; ---.

Seagoe, May V. Prediction of Achievement in Elementary Algebra. J. Appl. Psychol. 22: 493-503; Oct. 1938. (c-22, f-2b)

An algebra prognosis or arithmetic test yielded more reliable prediction data than did any IQ test.

r; ---; 1-only; 121 students; 6.4; gr. 9; ---; ---; ---.

Shaw, Geraldine Sax. Prediction of Success in Elementary Algebra. Math. Teach. 49: 173-178; Mar. 1956. (c-22)

While three predictors of algebra success were identified, it was concluded that none (or all in combination) was correlated high enough to warrant definite prognosis for individual students.

r; ---; 2-s; 387 students; 1.6, 6.4; gr. 9; ---; norm; ---.

5

Stein, Harry L. Characteristic Differences in Mathematics Traits of Good, Average, and Poor Achievers in Demonstrative Geometry. Math. Teach. 36: 164-168; Apr. 1943. (c-23)

The factors most closely related to success in demonstrative geometry were general intelligence and ability to manipulate symbols as in algebra, with many other traits related but to a lesser extent. Some differences were noted at three achievement levels.

r; ---; 2-s; 260 students; 3.2, 3.4, 3.5, 3.15, 6.2, 6.3; gr. 11;

---; norm, non-norm; ---.

Torgerson, T. L. and Aamodt, Geneva P. The Validity of Certain Prognostic Tests in Predicting Algebraic Ability. J. Exp. Ed. 1: 277-279; Mar. 1933. (c-22)

Two aptitude and an IQ test were equally effective in predicting algebra grades (.6). The sharpest discrimination was made by the IQ test; students with IQ's below 90 failed algebra.

r; ---; 2-s; 236 students; 1.6, 6.4; gr. 9; ---; norm; ---.

Wolking, William D. Predicting Academic Achievement with the Differential Aptitude and the Primary Mental Abilities Tests. J. Appl. Psychol. 39: 115-118; Apr. 1955. (f-2b)

An aptitude test predicted algebra achievement better than an IQ test.

r; ---; 1-only; 266 students; 3.15, 6.4; gr. 11; ---; norm; ---.

Achievement evaluation: Related to prediction (f-2c)

Other References

Billig, 1944	(a-6)
Burgert, 1935	(e-6)
Chapman, 1962	(e-3b)
Davidson & Gibney, 1969	(a-4)
Dinkel, 1959	(f-1a)
Douglass, 1935	(r-2)
Douglass & Kinney, 1938	(r-2)
Dunlap, 1935	(f-1a)
Fowler, 1961	(c-22)
Fremer, Coffman, & Taylor, 1968	(a-7)
Frost & Brandes, 1956	(f-1a)
Hanna, Nov. 1966	(r-2)
Hanna, 1968	(t-1a)
Hastings, 1944	(e-5)
Hegstrom & Riffle, 1963	(e-3b)
Holzinger & Swineford, 1946	(g-4)
Lee, J. M. & Lee, D. M., 1932	(f-1a)
Malinen, 1969	(a-4)
Pinsky & Gorth, 1969	(f-1a)
Posamentier, 1966	(d-7)
Sabers & Feldt, 1968	(f-1a)
Schwellenbach, 1954	(c-22)
Van Horn, 1966	(g-4)

Effect of parental knowledge (f-3)

[No research reports were assigned with a primary reference to this category.]

Other References

Bachman, 1970	(a-6)
Harrison, F. I., June 1969	(e-7)
Hill, 1967	(a-6)

Effect of teacher background (f-4)

Alexander, A. M. Teacher Judgment of Pupil Intelligence and Achievement is Not Enough. El. Sch. J. 53: 396-401; Mar. 1953. (f-2b)

It was concluded that teachers may expect to be correct in their judgment of students of highest and lowest intelligence slightly less than 60 per cent of the time and correct about arithmetic achievement in relation to capacity about 22 per cent of the time.

s; ---; ---; 35 teachers; 1.6; grs. 3-8; ---; norm; ---.

Duncan, Roger. An Experimental Study of the Effect of Parents' Knowledge on Study Performance in SMSG Mathematics. J. Ed. Res. 58: 135-137; Nov. 1964. (d-9)

Knowledge of SMSG mathematics by parents resulted in significantly higher achievement scores for their children.

(I) parental knowledge. (D) achievement.

e; 3.22; 2-s, 3-m; 311 students; 3.4, 3.5; gr. 7; 1 semester; norm, non-norm; 31 (3, 3, 4, 5, 5, 2, 3, 3, 3).

Morton, R. L. The Influence of Pupil Conduct on Teachers' Marks. Ed. Res. B. 11: 57-60; Feb 3, 1932.

The correlation between deportment and marks was found to be .432, while the correlations between deportment and such variables as arithmetic, reading, and intelligence standardized test marks were found to range from -.053 to .086, indicating that deportment influenced marking.

r; ---; 1-only; 300 students; 6.4; grs. 5-8; ---; ---; ---.

Rosenbloom, Paul C.; et al. Characteristics of Mathematics Teachers That Affect Students' Learning. Final Report. Sept. 1966. (ERIC Document No. ED 021 707) (a-6, d-9, t-2d)

Teaching effectiveness was found to contribute significantly to student attitudes and perceptions.

s; ---; 1-only; 127 teachers; ---; grs. 7-12, in-service; ---; ---; ---.

Sanderson, Goulding E. and Anderson, Kenneth E. A Study of the Influence of an Inspirational Science or Mathematics Teacher Upon Student Achievement as Measured by the National Merit Scholarship Qualifying Test. *Sch. Sci. Math.* 60: 339-347; May 1960. (a-6)

Having an "inspirational" teacher favorably affected achievement on a mathematics test; however, few students selected mathematics as the area in which a teacher was "inspirational".

(I) preference for teacher. (D) achievement.

f; ---; 2-s, 3-r; 300 students; 1.4, 3.3, 3.4; gr. 12; ---; norm;

---.

Stone, Vernon W. Student Interest in Science and Mathematics and the "Introductory" Teacher. *Sch. Sci. Math.* 59: 249-253; Apr. 1959. (a-6)

When students selected the "best teachers", and these teachers were then scheduled to teach ninth grade courses, enrollment in subsequent mathematics courses increased.

(I) preference for teacher. (D) preference for course.

a; ---; ---; 1 school; 1.6, 1.9; grs. 7-12; ---; ---; ---.

Upshall, C. C. and Masters, Harry V. An Analysis of the Scores of Eighth-Grade Pupils and Normal School Students on Certain Objective Tests. *J. Exp. Ed.* 2: 310-316; Mar. 1934. (f-2, t-1a)

Entering normal-school students were found to be significantly inferior to eighth grade students on a test of arithmetic computation, but were superior on other tests. After normal school training they are superior on all tests.

s; ---; 1-only; 2 groups; 1.4, 1.5, 3.18, 6.4; gr. 8, college; ---;

non-norm; ---.

Effect of teacher background (f-4)

Other References

Amidon & Flanders, 1961	(a-4)
Beberman & Van Horn, 1960	(t-2b)
Brandenburg, 1967	(a-7)
Dunn, 1937	(f-2c)
Hively, 1968	(t-2b)
Houston & Bentzen, 1969	(t-2d)
Lessing, Zagorin, & Nelson, 1970	(e-5)
Scaramuzzi, 1956	(c-2)
White, W. F. & Aaron, R. L., 1967	(e-5)

Cluley, John B. A Study of the Relative Amounts of Transfer Resulting from Three Methods of Study. J. Exp. Ed. 1: 34-41; Sept. 1932. (c-8)

1) Students taught objectively appeared to achieve and transfer more than students taught by formal rules or those who received additional practice.
2) The time allotted to study was probably not long enough to produce instructional and transfer gains sufficiently large, considering the large gains from practice effect of two applications of two tests, to be considered statistically significant.

(I) three methods of instruction. (D) achievement.

e; 3.4; 2-s, 3-m; 285 students; 1.1, 1.4, 1.5, 1.6, 1.12, 3.15,

3.17; grs. 6, 7; 2 days (retention, 1 wk.); norm, non-norm;

33 (3, 4, 5, 4, 4, 4, 3, 3, 3).

DiMichael, Salvatore G. The Transfer Effects of a How-To-Study Course Upon Different IQ Levels and Various Academic Subjects. J. Ed. Psychol. 34: 166-175; Mar. 1943.

A course on how-to-study had no significant effect on algebra achievement scores.

(I) how-to-study lessons; ability. (D) achievement; transfer.

e; 3.5; 2-s, 3-m; 192 students; 3.4; gr. 9; 1 term; ---;

26 (2, 3, 3, 3, 3, 3, 3, 3, 3).

Grossnickle, Foster E. Transfer of Knowledge of Multiplication Facts to Their Use in Long Division. J. Ed. Res. 29: 677-685; May 1936. (c-3c, c-3d)

1) On a multiplication test 371 errors were made, while 764 multiplication errors were found in division. Only 22 of these were common to both tests.
2) One zero fact in either multiplication or division seemed sufficient to give a reliable basis to determine if zero facts for that process were known.
3) Only partial transfer of knowledge of multiplication facts to long division was evidenced.

Transfer (g-1)

s; ---; 1-only; 1075 students; 1.1; grs. 5-12, college; 1 testing; non-norm; ---.

Scandura, Joseph M. Extra-Scope Transfer in Learning Mathematical Rules. Final Report. May 1970. (ERIC Document No. ED 040 885)

Students were able to generalize from restricted rule statements. Achievement on the second problem of a pair was related to performance on the first item of a pair.

(I) rule statements. (D) problem solving achievement.

e; 3.19; 1-only; 66 students; ---; sec.; ---; ---; ---.

Scandura, Joseph M. and Durnin, John H. Extra-Scope Transfer in Learning Mathematical Strategies. J. Ed. Psychol. 59: 350-354; Oct. 1968. (d-5)

Students given more general strategies had higher transfer scores than students given a more specific strategy.

(I) three types of strategy statements. (D) achievement; transfer.

e; 2.8; 2-s, 3-r; 88 students; 2.3, 2.6; sec.; 40 minutes; ---; 20 (2, 3, 2, 2, 2, 2, 2, 2, 3).

Other References

Johnson, H. C., 1944	(d-7)
Meconi, Fall 1967	(a-4)
Ray, 1961	(a-4)
Retzer, 1969	(c-13)
Retzer & Henderson, 1967	(c-13)
Ulmer, 1939	(g-4)

Challman, Mildred E. The Retention of Arithmetic and Algebra in Relation to Achievement in Plane Geometry. Math. Teach. 39: 77-79; Feb. 1946. (c-23, f-1b)

Scores on arithmetic and algebra tests increased after geometry, with correlations indicating that ability in arithmetic and algebra were factors associated with achievement in geometry.

(I) geometry course. (D) achievement in algebra and arithmetic.

a; ---; 1-only; 107 students; 1.4, 2.6, 6.4; gr. 10; 1 yr.; norm,

non-norm; ---.

Davis, Robert A. and Rood, Edward J. Remembering and Forgetting Arithmetical Abilities. J. Ed Psychol. 38: 216-222; Apr. 1947.

1) Skills in fundamental operations, fractions, decimals, per cent, and problem solving tended to increase with each testing period.
2) Comparisons of various testing periods showed the amount lost and then regained at later testings.

s; ---; 1-only; 56 students; 1.6; grs. 7, 8; 20 mos. (5 testings);

norm; ---.

Gay, Lorraine R. An Investigation Into the Differential Effectiveness for Males and Females, of Three CAI Treatments on Delayed Retention of Mathematical Concepts. Nov. 15, 1969. (ERIC Document No. ED 034 426) (d-6a, e-6)

Girls who received a variable number of examples retained significantly more than those in groups where the number was fixed or at choice. Boys retained more when they could choose.

(I) number of examples; sex. (D) achievement; retention.

e; 3.3 r; 2-s, 3-r; 53 students; 3.2; gr. 8; ---; ---; ---.

Lahey, Sister M. Florence Louise. Permanence of Retention of First-Year Algebra. J. Ed. Psychol. 32: 401-413; Sept. 1941. (c-22)

A loss of 10 per cent in fundamental operations occurred over the summer and again during the first semester for algebra students studying geometry, but scores remained stable from then until June. Problem solving scores increased.

r; ---; 1-only; 229 students; 1.4, 1.6, 6.4; gr. 9; retention, 1 yr.;

non-norm; ---.

Layton, Edna Thompson. The Persistence of Learning in Elementary Algebra. J. Ed. Psychol. 23: 46-55; Jan. 1932. (c-22)

Students retained about one-third of their knowledge of algebra during a year with no mathematical instruction.

(I) no instruction. (D) retention.

f; ---; 1-only; 51 students; 1.3, 1.4, 1.6, 6.4; gr. 9; retention,

1 yr.; norm; ---.

Osburn, W. J. and Foltz, P. J. Permanence of Improvement in the Fundamentals of Arithmetic. Ed. Res. B. 10: 227-234; Apr. 29, 1931. (c-3)

Average loss between April and September ranged from 3/5 to less than 1/12 of the amount of gain between the previous September and April. The greatest loss occurred in those grades in which the subject-matter had been taught for the first time.

(I) individual practice on errors. (D) achievement; retention.

a; ---; 1-only; 14 schools; 1.4, 1.6; grs. 2-8; 1 yr.; norm; ---.

Schrepel, Marie and Laslett, H. R. On the Loss of Knowledge by Junior High-School Pupils Over the Summer Vacation. J. Ed. Psychol. 27: 299-303; Apr. 1936.

Decreases in arithmetic computation scores were greater than for other areas of the curriculum.

(I) summer vacation. (D) retention.

f; ---; 1-only; 246 students; 1.5; grs. 8, 9; ---; norm; ---.

Other References

Douglass, Oct. 1936	(r-2)
Guiler, Mar. 1946	(c-5)
Meadowcroft, Dec. 1965	(d-5)
Meconi, Fall 1967	(a-4)
Otto, 1965	(g-5)
Ray, 1961	(a-4)
Tredway & Hollister, 1963	(c-6)

Generalization (g-3)

Ebert, Reuben S. Generalization Abilities in Mathematics. *J. Ed. Res.* 39: 671-681; May 1946.

Wide variations in generalization ability were found. Among the specific conclusions were:

1) Students wrote mathematical patterns more easily from observed patterns than from sentence statements.
2) There was a strong correlation between ability to write sentence statements of observed patterns and ability to write mathematical illustrations of sentence statements.
3) Generalization achievement was different for different mental-ability and different reading-ability groups, always in favor of the higher ability groups.
4) Generalizations dealing with number relationships in one process were easiest, and those dealing with common-fraction relationships were most difficult.
5) The writing of general truths or facts in sentence statements was by far more difficult than writing mathematical illustrations or relationships.

s; ---; 1-only; 674 students; 1.4, 3.15, 6.4; gr. 8; 5 days; norm, non-norm; ---.

Scandura, Joseph M.; Woodward, Ernest; and Lee, Frank. Rule Generality and Consistency in Mathematics Learning. *Am. Ed. Res. J.* 4: 303-319; May 1967. (c-9)

Performance on within-scope problems did not differ appreciably for either junior high or college groups. A more general rule was easier to apply to more problems than a specific one.

e; 2.16; 2-s, 3-r; 269 students; 2.3, 2.6; grs. 6-8, college; ---; ---; 20 (2, 2, 2, 1, 1, 2, 3, 3, 4).

Other References

Henderson & Rollins, 1967	(a-4)	Retzer, 1969	(c-13)
Jeffery, 1969	(f-1a)	Retzer & Henderson, 1967	(c-13)

Banghart, Frank W. and Spraker, Harold S. Group Influence on Creativity in Mathematics. J. Exp. Ed. 31: 257-263; Mar. 1963. (c-14, c-15, d-9, e-4)

No significant difference was found between group and individual work on measures of creativity.

(I) group or individual work; ability. (D) creativity.

e; 3.4; 1-only; 180 students; 3.4, 3.5, 6.4; gr. 7; ---; norm,

non-norm; 27 (3, 3, 3, 4, 3, 2, 3, 3, 3).

Cook, Inez M. Developing Reflective Thinking Through Geometry. Math. Teach. 36: 79-82; Feb. 1943. (c-23)

Students who were taught reasoning and transfer procedures increased scores on the reasoning test slightly more than students who had only the usual geometry course (but also gained in reasoning). Geometry test scores were comparable.

(I) emphasis on thinking. (D) achievement in geometry and reasoning.

a; ---; 2-s, 3-s; 402 students; 1.3, 1.6, 1.8; gr. 10; 1 semester;

non-norm; ---.

Henry, L. K. The Role of Insight in Plane Geometry. J. Ed. Psychol. 25: 598-610; Nov. 1934. (c-13, c-23)

With correct application of known theorems to the solution of simple original problems as a criterion, "insight" was found to have operated in only 32 per cent of the cases.

s; ---; 1-only; 32 students; 1.1, 1.6; gr. 10; 2 hrs.; ---; ---.

Holzinger, Karl J. and Swineford, Francis. The Relation of Two Bi-Factors to Achievement in Geometry and Other Subjects. J. Ed. Psychol. 37: 257-265; May 1946. (c-23, f-2c)

Correlations of various predictor tests and achievement were presented; the best predictors for geometry success correlated .77.

Thought processes (g-4)

r; ---; 2-s; 174 students (5 classes); 6.3, 6.4; grs. 10-12; ---;

norm, non-norm; ---.

Jackson, Nelson A. Learning in First Year Algebra. Sch. Sci. Math. 31: 980-987; Nov. 1931. (a-5a, c-22)

On a series of tests, little increase in mastery of algebra skills was noted.

(I) algebra course. (D) achievement.

a; ---; 1-only; 1 class; 1.6; gr. 9; 14 wks.; non-norm; ---.

Jackson, William N. The Role of Algebra in the Development of Relational Thinking. Math. Teach. 48: 528-534; Dec. 1955. (a-4, c-22)

Students made significant improvement in ability to perceive various types of relationships in data.

(I) emphasis on interpreting data. (D) achievement.

a; ---; 1-only; 2 classes; 1.4, 3.4; gr. 9; 1 yr.; non-norm; ---.

Kennedy, Wallace A. and Walsh, John. A Factor Analysis of Mathematical Giftedness. Psychol. Reports 17: 115-119; Aug. 1965. (e-3)

High ability in mathematics appeared to be related to factors on personality tests which can be described as awareness of power structure, concern with theoretical rather than social issues, and emotionality. Mathematical ability appeared to be not a specific ability, but related to overall high ability.

r; ---; 2-s; 153 students; 6.1; sec.; ---; norm; ---.

Kim, Sharon and Leton, Donald A. Analysis of Mathematical Abilities Required for Success in Ninth-Grade Mathematics. Dec. 1966. (ERIC Document No. ED 010 420)

Mathematical ability was found to be comprised of a number of aptitudes and not simply a unitary trait.

s; ---; 1-only; 5 groups; 3.2, 3.5, 6.1; gr. 9; ---; ---; ---.

Massimiano, Carmen C. The Influence of the Study of Plane Geometry on Critical Thinking. Math. Teach. 49: 151-153; Feb. 1956. (c-23)

Students taking geometry tended to improve in critical thinking scores more than those not taking geometry. Success in geometry did not seem to be closely associated.

(I) geometry course. (D) critical thinking.

f; ---; 2-m; 531 students; 1.5, 3.4, 6.3, 6.4; gr. 10; 7 mos.;

norm; ---.

Moore, William J. and Cain, Ralph W. The New Mathematics and Logical Reasoning and Creative Thinking Abilities. Sch. Sci. Math. 68: 731-733; Nov. 1968. (c-13)

Students using a "modern" program had significantly improved scores in logical reasoning, word fluency, and associational fluency.

(I) type of program. (D) achievement.

a; ---; 1-only; 2 classes (37 students); 3.4; grs. 9-12; 1 yr.;

non-norm; ---.

Pitts, Lemuel and Davis, Robert A. A Comparison of the Analytic and Synthetic Methods of Teaching Geometry. Sch. Sci. Math. 31: 333-339; Mar. 1931. (c-23)

The analytic method, when used as the only method, was not as effective as the synthetic method.

(I) analytic or synthetic methods. (D) achievement.

e; 3.1 r; 2-s, 3-m; 4 classes; 1.4, 1.5, 1.6; gr. 10; 6 wks.

(retention); norm; 35 (3, 3, 4, 5, 4, 3, 5, 4, 4).

Restle, Frank. A Study of Psychological Patterns in Learning Elementary Mathematics. 1966. (ERIC Document No. ED 010 184)

Sequences in counting a group of objects, methods for solving a problem, adding large numbers involving carrying, and multiplying were investigated. The construction of a variety of tasks emphasized the slightly different discriminations.

Thought processes (g-4)

s; ---; ---; 152 students; ---; elem.-college; ---; ---; ---.

Rosen, Ellen F. and Stolurow, Lawrence M. In Pursuit of a Simplex in UICSM High School Algebra. Comparative Studies of Principles for Programming Mathematics in Automated Instruction. Technical Report Number 5. July 1964. (ERIC Document No. ED 021 478) (c-22, d-5, d-9, f-1a)

Analysis of progress test scores did not demonstrate that a hierarchal concept is involved in learning mathematics.

r; ---; ---; ---; 6.4; gr. 9; ---; ---; ---.

Scandura, Joseph M. Algorithm Learning and Problem Solving. J. Exp. Ed. 34: 1-6; Summer 1966(a).

Neither successful solving of problems nor transfer appeared to be dependent on "understanding".

(I) four types of information about problem solving. (D) achievement on three types of problems.

e; 2.7; 2-s, 3-r; 84 students; 3.4; gr. 11; 1 day; non-norm;

26 (2, 4, 4, 2, 2, 3, 3, 3, 3).

Scandura, Joseph M. Problem Solving and Prior Learning. J. Exp. Ed. 34: 7-11; Summer 1966(b).

Prerequisite practice facilitated routine problem solving, but affected generalization and novel transfer problem solving less. No significant effects due to criterion practice were found.

(I) prerequisite and/or criterion practice. (D) achievement; retention.

e; 2.7 r; 2-s, 3-r; 80 students; 2.6, 3.2; gr. 11; 1 day (retention,

5 wks.); ---; 26 (2, 3, 4, 3, 3, 3, 2, 3, 3).

Schnur, James O. A Study of the Possible Improvement of Problem Solving Ability in Migrant Children. Sch. Sci. Math. 69: 821-826; Dec. 1969. (ERIC Document No. EJ 013 674) (d-3, e-5)

Use of attribute blocks did not enhance a reflective learning style.

(I) use of attribute blocks. (D) achievement.

e; 2.4; 2-s, 3-r; 18 students; 2.3, 3.4; ages 4-14; 6 days; norm;

23 (4, 3, 3, 3, 3, 2, 1, 3, 1).

Swineford, Frances. A Number Factor. J. Ed. Psychol. 40: 157-167; Mar. 1949. (a-6)

Evidence is set forth that there exists a number factor common to tests which contain numbers. This factor seemed allied with a student's mental set, determined by his general liking for numbers.

s; ---; 1-only; 471 students; 3.4, 6.1, 6.4; gr. 9; ---; norm; ---.

Swineford, Frances. General, Verbal, and Spatial Bi-Factors After Three Years. J. Ed. Psychol. 40: 353-360; Oct. 1949. (e-6)

Three bi-factors identified in sixth-graders tended to remain in ninth graders. Increases were found in the general and verbal factors, but the spatial factor appeared stable.

r; ---; 1-only; 88 students; 1.4, 6.2, 6.4; gr. 9; ---; ---; ---.

Travers, Kenneth J.; et al. Preferences for Modes of Expression in Mathematics. May 1967. (ERIC Document No. ED 050 962)

Students preferred a symbolic mode of representation rather than verbal and graphic modes.

r; ---; 1-only; 115 students; ---; jr. high; ---; norm; ---.

Ulmer, Gilbert. Teaching Geometry to Cultivate Reflective Thinking: An Experimental Study with 1239 High School Pupils. J. Exp. Ed. 8: 18-25; Sept. 1939. (c-13, c-23, g-1)

Students specifically taught methods of reflective thinking in geometry classes made clearly higher gains on a reasoning test than those not given special methods.

(I) study of principles of reflective thinking; geometry or nongeometry classes; IQ. (D) reasoning scores.

Thought processes (g-4)

e; 3.12; 2-s; 36+ classes (1239 students); 1.1, 1.4, 1.5; grs. 10, 11; ---; ---; 33 (2, 4, 4, 5, 4, 4, 4, 3, 3).

Van Horn, Charles. A Comparison Between Two Kinds of Secondary Mathematics Courses with Respect to Intellectual Changes. Oct. 1966. (ERIC Document No. ED 011 059) (d-9, f-2c)

Students enrolled in UICSM courses excelled on more than half the tests; it appeared that the abilities most important in mathematics are those requiring the operations of cognition and convergent production. Measures of cognition of symbolic systems were not found to be valid predictors of algebra achievement.

(I) UICSM or other materials. (D) achievement.

e; 3.4; 2-s; ---; ---; gr. 9; 1 yr.; ---; ---.

Wohlwill, Joachim. The Learning of Absolute and Relational Number Discriminations by Children. J. Genet. Psychol. 101: 217-228; July 1963. (c-2, g-6b)

1) At all grades the perceptual condition (dots) yielded very fast learning of the relational task, while half of the subjects failed to learn an absolute task. This marked difference between relational and absolute learning was somewhat reduced for the abstract condition, and reversed for the symbolic condition.

2) Substantial age differences appeared under the symbolic condition only.

(I) three types of number series; reinforcement for absolute or relational responses; four age levels. (D) trials to criterion.

e; 3.19; 1-only; 240 students; 1.4, 3.2; grs. 1, 3, 5, 8; 1 session; ---; 28 (3, 2, 2, 3, 5, 3, 4, 2, 4).

Other References

Bittinger, 1968	(r-2)
Campbell, 1964	(a-4)
DuBois & Feierabend, 1959	(r-2)
Fitzgerald, 1963	(b-4)
Heimer, 1969	(r-2)
Jeffery, 1969	(f-1a)
Kennedy, G.; Eliot, J.; & Krulee, G., 1970	(a-5b)
Kieren, 1969	(r-2)
Kilpatrick, 1969	(r-2)
King, 1970	(r-2)
Mayeske & Weinfeld, 1967	(f-1a)
Meconi, Fall 1967	(a-4)
Michael, 1949	(a-4)
Niedermeyer, Brown, & Sulzen, 1969	(d-5)
Price, J., 1967	(a-4)
Prouse, 1967	(e-3)
Roberge, 1970	(c-13)
Rosskopf, 1968	(r-2)
Wiviott, 1970	(c-23)

Motivation (g-5)

Brandes, Louis Grant. Using Recreational Mathematics Materials in the Classroom. Math. Teach. 46: 326-329; May 1953.

A summary of a survey of the uses made of recreations in mathematics classes and teacher opinions regarding their effectiveness was presented.

s; ---; ---; ---; ---; sec.; ---; ---; ---.

Brown, Francis J. Knowledge of Results as an Incentive in School Room Practice. J. Ed. Psychol. 23: 532-552; Oct. 1932. (g-6a)

Children who had knowledge of results of scores achieved higher scores than groups ignorant of results. Boys appeared to be more easily influenced by such an incentive than girls.

(I) knowledge or ignorance of results; grade level; type of test.
(D) achievement.

e; 3.3; 2-m, 3-s; 138 students (4 classes); 1.4, 1.5; grs. 5, 7;

20 days; non-norm; 29 (2, 3, 3, 2, 4, 4, 4, 4, 3).

Campbell, Vincent N.; et al. Effects of Mathematical Ability, Pretraining, and Interest on Self-Direction in Programed Instruction. Oct. 1963. (ERIC Document No. ED 014 914) (c-22, d-5, f-2b)

Self-directed programs were more popular with high ability students and more effective after practice and discussion on self-direction.

(I) linear or self-directed programs; payment or no payment.
(D) achievement; attitude.

e; 3.8; 1-only; 34 students; 3.5; gr. 9; ---; non-norm; ---.

Christensen, Donald J. The Effect of Discontinued Grade Reporting on Pupil Learning. Arith. Teach. 15: 724-726; Dec. 1968. (f-2)

Students who had received letter grades the first semester were told they would receive a grade of "pass" the second semester. Achievement gain was over 11 months for the second semester, though students reported dislike of not receiving grades.

(I) grade or no grade for a semester. (D) achievement.

e; 2.18; 2-s, 3-a; 24 students; 1.3, 6.4; gr. 8; 2 semesters; norm, non-norm; 29 (2, 3, 3, 4, 5, 2, 4, 3, 3).

Cook, Walter W. Some Effects of the Maintenance of High Standards of Promotion. El. Sch. J. 41: 430-437; Feb. 1941.

No significant differences in arithmetic achievement were found in schools having high or low promotion ratios.

(I) high or low promotion ratio. (D) achievement.

f; ---; 2-s; 18 schools (560 students); 1.4, 1.7, 3.15; gr. 7; ---; norm; ---.

Cromack, Norman E. An Assessment of a Mathematics League as Judged by Its Participants. Math. Teach. 63: 432-438; May 1970. (ERIC Document No. EJ 020 684) (e-3)

Mathematics contests apparently provided a way for students to express interest, rather than increasing interest. Student and teacher reactions were favorable, with few detrimental effects noted.

s; ---; 2-s; 124 students, 26 teachers (25 schools); 1.6, 3.2; sec.; ---; non-norm; ---.

Holtan, Boyd. Motivation and General Mathematics Students. Math. Teach. 57: 20-25; Jan. 1964. (a-6, c-21, d-5)

Four programs were found to be equally effective as motivational vehicles when content was selected for student interests.

(I) four types of motivation (interests). (D) achievement.

e; 3.8 r; 2-s, 3-s; 136 boys; 1.4, 3.2, 3.5; gr. 9; 2 days (retention, 3 wks.); non-norm; 29 (3, 4, 4, 3, 3, 3, 3, 3, 3).

Motivation (g-5)

Kowitz, G. T. and Armstrong, C. M. The Effect of Promotion Policy on Academic Achievement. El. Sch. J. 61: 435-443; May 1961.

Arithmetic achievement of students in grade 10 who had been retained prior to grade 7 was lower than that of students who had not been retained. Increases in achievement were greater in schools with high retention rates, but attributable more to students threatened by retention than by actual retention.

(I) retention or non-retention. (D) achievement.

f; ---; 1-only; 2 schools; 1.6, 3.2; gr. 10; ---; ---; ---.

Otto, Wayne. Inhibitory Potential in Good and Poor Achievers. J. Ed. Psychol. 56: 200-207; Aug. 1965. (g-2)

The relationship of reactive inhibition to skill attainment in arithmetic, spelling and handwriting, and the effect of "motivating" instructions on inhibitory potential were investigated in two related studies. On a digit-printing task, poor achievers in spelling and handwriting dissipated more reactive inhibition than did good achievers. This was not true for arithmetic; good achievers made proportionately greater gains than poor achievers, apparently because of intrinsic motivation.

(I) arithmetic achievement levels; grade level. (D) number of digits reproduced; acquisition and reminiscence gain.

f; ---; 2-s, 3-s; 100 students; 3.2, 3.3, 6.3; grs. 4-8; 1 session;

---; ---.

Rising, Gerald R. and Ryan, James J. Effects of Experimental Programs for Secondary Mathematics on Pupil Interest in Mathematics as Indicated by an Overt Participation Index of Interest. July 1966. (ERIC Document No. ED 011 941) (a-4, a-6, d-9)

One experimental program (UICSM) might have contributed to greater student interest in mathematics in grades 9 and 10.

(I) experimental or conventional instruction. (D) interest.

e; 3.4; 1-only; 60 classes; ---; grs. 9-11; ---; ---; ---.

Russell, Ivan L. Motivation for School Achievement: Measurement and Validation. J. Ed. Res. 62: 263-266; Feb. 1969. (ERIC Document No. EJ 001 801) (f-1a)

Students who volunteered for an academic content had significantly higher mean scores on a motivation test than did non-volunteers. Algebra students scored significantly higher than general mathematics students.

(I) volunteers or non-volunteers; type of course. (D) motivation test score.

f; ---; 2-s; 90 students; 1.4, 3.4, 6.4; gr. 9; ---; non-norm; ---.

Sawin, E. I. Motivation in Mathematics: Its Theoretical Basis, Measurement, and Relationships with Other Factors. Math. Teach. 44: 471-478; June 1951. (a-6, f-1a)

Scores from a test on motivation in mathematics were correlated with aptitude scores and with certain achievement scores.

r; ---; 1-only; 116 students; 6.4; gr. 9; ---; non-norm; ---.

Tiemens, Robert K. The Comparative Effectiveness of Sound Motion Pictures and Printed Communications for the Motivation of High School Students in Mathematics. 1962. (ERIC Document No. ED 003 573) (c-22, d-4)

Relating mathematics to vocational goals and use of films illustrating practical applications of mathematics were found to be effective in motivating students.

(I) type of motivation. (D) attitude; achievement.

a; ---; 1-only; 17 schools; ---; gr. 9; ---; ---; ---.

White, Clyde W. The Effects of Exemptions from Semester Examinations on the Distribution of School Marks. Sch. R. 39: 293-299; Apr. 1931.

Marks in mathematics changed only slightly during the years students could be exempted from final examinations.

(I) exemption from final tests. (D) marks.

f; ---; 1-only; 10,000 students; 1.3, 1.6, 1.8; sec.; 8 yrs.; ---; ---.

Motivation (g-5)

Other References

Campbell, 1964	(a-4)
Kamii & Weikart, 1963	(f-2c)
Mayor, 1949	(t-2c)
Parkinson, 1961	(a-6)
Porter, 1938	(r-2)
Rising & Ryan, Aug. 1966	(t-2c)
Scaramuzzi, 1956	(c-2)
White, W. F. & Aaron, R. L., 1967	(e-5)

McManis, Donald L. Conservation of Identity and Equivalence of Quantity by Retardates. J. Genet. Psychol. 115: 63-69; Sept. 1969. (ERIC Document No. EJ 009 596)

Occurrence of identity conservation and equivalence conservation was not simultaneous in all children. Identity conservation was necessary, but not sufficient, to insure equivalence conservation.

s; ---; 1-only; 60 students; 1.6, 3.4; MR's - CA 10-15, MA 5-8;

---; ---; ---.

McManis, Donald L. Comparison of Gross, Intensive, and Extensive Quantities by Retardates. J. Genet. Psychol. 115: 229-236; Dec. 1969. (ERIC Document No. EJ 001 814)

All succeeded in gross quantity comparisons, while success was (1) greater on intensive comparisons (involving seriation through addition) than on extensive (involving seriation through multiplication) and (2) a positive function of MA.

s; ---; 1-only; 140 students; 1.4, 3.2; MR's - CA 7-21, MA 5-8;

---; ---; ---.

Knowledge of results (g-6a)

Kinzer, John R. and Worcester, Dean A. *The Effectiveness of Adjunct Auto-Instruction.* 1965. (ERIC Document No. ED 003 386; ED 003 336)

No significant differences were found for groups having feedback immediately or one hour, two days, or one week later.

(I) feedback delay. (D) achievement.

e; 3.4; ---; ---; ---; gr. 9; ---; non-norm; ---.

Paige, Donald D. Learning While Testing. *J. Ed. Res.* 59: 276-277; Feb. 1966. (c-15, f-1a)

Immediate reinforcement after a testing situation resulted in significantly higher achievement scores.

(I) immediate or delayed reinforcement. (D) retention.

e; 2.6 r; 2-m, 3-r; 62 students; 1.4, 3.15, 6.4; gr. 8; 4 wks.

(retention, 3 wks.); non-norm; 22 (3, 3, 2, 2, 2, 4, 1, 2, 3).

Other References

Brown, F. J., 1932	(g-5)
Meconi, Fall 1967	(a-4)

Bivens, Lyle W. Feedback Complexity and Self-Direction in Programmed Instruction. Psychol. Reports 14: 155-160; Feb. 1964. (c-12, d-5)

No difference in achievement was found between groups given feedback that was explicit or that required interpretation for programs on set theory.

(I) type of feedback. (D) achievement.

e; 3.22; 2-s, 3-r; 128 students; 1.4; gr. 8; 30 minutes; non-norm;

26 (3, 2, 2, 2, 3, 4, 4, 3, 3).

Doherty, Anne and Wunderlich, Richard A. Effect of Secondary Reinforcement Schedules on Performance of Problem-Solving Tasks. J. Exp. Psychol. 77: 105-108; May 1968.

Performance on problem-solving tasks was affected by increasing the rate of secondary reinforcement.

(I) age; IQ; arithmetic achievement; variation in reinforcement schedules. (D) number of problems completed.

e; 3.5; 2-m, 3-s; 90 boys; 3.2, 3.4; grs. 7, 8; ---; norm;

22 (2, 2, 2, 3, 4, 2, 3, 2, 2).

Hughes, Herbert H. and Nelson, Willard H. The Effect of Reward on Expectancy and Test Performance of Low and High Achievers with High Ability Scores. J. Res. Services 3: 22-29; Dec. 1963. (e-2a, f-1, f-2b)

Significant differences in performance scores were found between high and low achievers but were not dependent on being given a monetary reward for taking four subtests of an aptitude test.

(I) monetary reward following each subtest or no reward; previous achievement. (D) achievement.

e; 3.27; 2-s, 3-r; 40 students; 1.4, 3.2, 3.4, 3.5, 6.4; gr. 9; ---;

norm; 16 (3, 1, 1, 2, 2, 2, 1, 2, 2).

Reinforcement:
Other procedures (g-6b)

Nolen, Patricia A.; Kunzelmann, Harold P.; and Haring, Norris G. Behavioral Modification in a Junior High Learning Disabilities Classroom. Excep. Child. 34: 163-168; Nov. 1967. (e-2, e-2c, e-5)

Individual programs for students with serious learning and behavior disorders included highly interesting activities used to reinforce academic activities; significant achievement gains were recorded.

(I) individualized remedial program. (D) achievement.

a; ---; 2-s; 8 students; 1.1; ages 12-16; 100 days (24 wks.); norm;

---.

Paulson, Casper F., Jr. Slow Learners, Competition, and Programed Instruction. Aug. 31, 1964. (ERIC Document No. ED 003 204) (a-4, c-22, d-5, e-2b, e-4)

Homogeneous groups scored higher than heterogeneous groups on algebra achievement. Heterogeneous groups receiving public display of performance scored significantly higher gains than any of the other groups.

(I) homogeneous or heterogeneous grouping; public or individual feedback. (D) achievement.

e; 3.4; 2-s; 40 students; 3.2; gr. 9; ---; ---; ---.

Other Reference

Wohlwill, 1963 (g-4)

Piagetian concepts (g-7)

[No research reports were assigned with a primary reference to this category.]

Other Reference

Harrison, D. B., 1969 (r-2)

Conservation (g-7a)

[No research reports were assigned to this category.]

Elkind, D. Quantity Conceptions in Junior and Senior High School Students. Child Develop. 32: 551-560; 1961. (c-8)

Eighty-seven per cent of the students had abstract conceptions of mass and weight, but only 47 per cent had an abstract conception of volume. More boys than girls attained the volume concept.

s; ---; 1-only; 469 students; 1.4, 1.6, 2.6; grs. 7-12; ---; non-norm; ---.

Conservation:
Training (g-7a-2)

[No research reports were assigned to this category.]

Conservation: Relation to achievement (g-7a-3)

[No research reports were assigned to this category.]

Transitivity (g-7b)

Coon, Robert C. and Odom, Richard D. Transitivity and Length Judgments as a Function of Age and Social Influence. Child Develop. 39: 1133-1144; Dec. 1968.

As the age increased in the groups in which conformity pressure was exerted, the number of errors on a transitivity task decreased.

(I) conformity pressure; age. (D) performance

e; 3.4; 1-only; 120 students; 1.4, 1.6, 3.2, 3.21; ages 7, 11, 15;

---; ---; 16 (3, 1, 2, 1, 3, 2, 1, 1, 2).

Glick, Joseph and Wapner, Seymour. Development of Transitivity: Some Findings and Problems of Analysis. Child Develop. 39: 621-638; June 1968.

Correctness and justification of answers for verbal and concrete transitivity tasks reflected: 1) an increase in transitivity reasoning with age; 2) concrete tasks solicited more correct responses but fewer adequate justifications; 3) no apparent association of correct responses and adequate justifications.

(I) mode and form of presentation of stimulus. (D) correct justification for response.

e; 3.22; 2-s, 3-s; 320 students; 1.4, 1.6, 3.2; ages 8-18;

1 session; norm; 17 (2, 1, 2, 2, 3, 2, 2, 2, 1).

Classification and seriation (g-7c)

[No research reports were assigned to this category.]

Piagetian concepts:
Other (g-7d)

Pick, Herbert L., Jr. and Pick, Anne D. A Developmental and Analytic Study of the Size-Weight Illusion. J. Exp. Child Psychol. 5: 362-371; Sept. 1967. (c-8)

The developmental trends in magnitude of size-weight illusions may reflect differences in inter- and intra-modal integration, rather than age.

(I) age; weight and size of bottles. (D) intervals of uncertainty; subjective equality.

e; 3.19; 2-s, 3-r; 328 students; 1.4, 3.2; ages 4-16, adults; ---;

---; 23 (4, 1, 2, 2, 4, 2, 2, 3, 3).

Rimoldi, H. J. A.; Aghi, M.; and Burder, G. Some Effects of Logical Structure, Language, and Age in Problem Solving in Children. J. Genet. Psychol. 112: 127-143; Mar. 1968. (a-5b)

Language and age differences in problem-solving were investigated; problem-solving "logic" increased with age and was interactive with language.

s; ---; 2-s, 3-s; 120 students; 1.4, 3.2; ages 7, 9, 11, 13; ---;

non-norm; ---.

Other References

Boe, 1966	(c-23)
Boe, 1968	(c-23)

Pre-service (t-1)

[No research reports were assigned to this category.]

Pre-service: Competency
levels (t-1a)

Burnett, Collins and MacMinn, Paul. A Comparison of Teacher Education Students and Non-Teacher Education Students on Measures of Academic Aptitude and Achievement. J. Teach. Ed. 17: 312-316; Fall 1966.

Non-education students scored higher on a mathematics test than did education students at both freshman and junior levels.

s; ---; ---; 6498 students; 3.15; pre-service; ---; norm; ---.

Fenstermacher, Guy M. and Swineford, Frances. The National Teacher Examinations and the Appraisal of Teacher Preparation. J. Teach. Ed. 9: 429-434; Dec. 1958. (f-1a)

Characteristics and data of the 1958 NTE were presented.

s; ---; ---; ---; ---; pre-service; ---; ---; ---.

Hanna, Gerald S. An Empirical Comparison of Three Geometry Aptitude Tests. Sch. Sci. Math. 68: 8-10; Jan. 1968. (c-23, f-2c)

Past grades in algebra and arithmetic increased the predictive efficiency of geometry aptitude tests.

r; ---; 1-only; 226 students; 6.3, 6.4; gr. 10; ---; ---; ---.

Wiersma, William. A Cross-National Comparison of Academic Achievement of Mathematics Majors Preparing to Teach in the Secondary Schools. Sch. Sci. Math. 67: 389-394; May 1967. (a-7, f-2)

On mathematics tests, mathematics majors in Britain scored higher than those in the United States.

(I) type of background. (D) achievement.

f; ---; 2-s, 3-r; 128 students; 3.20, 4.4; pre-service; ---; norm;

---.

Pre-service: Competency levels (t-1a)

Other References

Glennon, 1949	(b-4)
Glennon, Winter 1949	(b-4)
Stoneking & Welch, 1961	(f-1b)
Sueltz, 1951	(f-2)
Upshall & Masters, 1934	(f-4)

Pre-service: *Preparation procedures* (t-1b)

Bompart, Bill. An Undergraduate Program Based on Certification Requirements. *Sch. Sci. Math.* 70: 805-812; Dec. 1970. (ERIC Document No. EJ 031 948) (t-2b)

Courses required in the various states were compiled; a program which would meet the requirements of all was not possible, but four- and five-year programs were suggested.

s; ---; 1-only; ---; 1.3, 1.4; pre-service; ---; ---; ---.

Davison, Hugh M. and Patrick, Robert B. *The Effectiveness of the Documentary Sound-Film as a Supplement in Secondary School Teacher Education--A Followup of First Year Teacher Performance*. Sept. 1, 1963. (ERIC Document No. ED 003 608) (t-2b)

First year teachers who had viewed films on certain teaching techniques during methods courses were rated more highly than those who had not seen the films.

(I) use of films. (D) ratings.

f; ---; 2-s; ---; ---; in-service; ---; non-norm; ---.

Fisher, J. J. The Extent of Implementation of Level I and Level III CUPM Recommendations, Panel on Teacher Training. *Am. Math. Monthly* 75: 290-292; Mar. 1968.

Course requirements increased significantly between 1960 and 1965.

s; ---; 2-r; 87 colleges; 3.4; pre-service (elem. and sec.); ---;

---; ---.

Goff, G. K. An Oklahoman Reports. *Am. Math. Monthly* 75: 1004-1005; Nov. 1968. (t-2b)

Requirements and electives in mathematics (for certification in Oklahoma) were tabulated.

s; ---; 1-only; 14 colleges; 1.1; pre-service (elem. and sec.); ---;

---; ---.

Kennedy, Joseph W. The Development of a Test of Skill in Solving Mathematics Teaching Problems. Contemp. Ed. 35: 54, 76; Nov. 1963. (f-1a, t-2b)

A test involving 17 classroom episodes was found to rank teachers in accordance with their levels of experience.

s; ---; 1-only; 311 teachers; 1.9, 3.2; pre- and in-service; ---;

---; ---.

Sarner, David S. and Frymier, Jack R. Certification Requirements in Mathematics and Science. Sch. Sci. Math. 59: 456-460; June 1959.

Only 42 states required a four-year college degree for certification; only one required five years of preparation. The mean number of semester hours required in mathematics was 15.

s; ---; ---; ---; 1.4; pre-service; ---; ---; ---.

Sarner, David S. and Frymier, Jack R. Certification Requirements in Mathematics and Science--A Follow-Up of Recent Changes. Sch. Sci. Math. 59: 745-746; Dec. 1959. (t-2a)

In this follow-up study, it was found that two states increased mathematics requirements for teaching and nine were considering changes.

s; ---; ---; ---; ---; pre-service; ---; ---; ---.

Shafer, Dale M. A Proposal for the Mathematics Methods Course. Math. Teach. 62: 623-627; Dec. 1969. (ERIC Document No. EJ 013 948)

A course was structured from recommendations from a survey of 200 mathematics educators.

s; ---; 2-s; 200 educators; 1.1; pre-service; ---; ---; ---.

Pre-service: Preparation procedures (t-1b)

Thacker, G. R. and Read, C. B. Courses Desirable for Training Teachers of High School Mathematics. *Sch. Sci. Math.* 49: 611-618; Nov. 1949. (t-2c)

Courses which teachers considered important in pre-service preparation were tabulated; courses related directly to teaching were generally ranked highest.

s; ---; 2-s; 453 teachers and dept. heads; 1.1, 1.9; pre- and in-

service; ---; ---; ---.

Wong, Ruth E. M. Geometry Preparation for High School Mathematics Teachers. *Am. Math. Monthly* 77: 70-78; Jan. 1970. (c-23)

Prospective teachers were required to take at least one course in geometry in most institutions. Emphasizing transformations in college level geometry was generally favored. More coordinate geometry, a vector approach, and a transformations approach at the high school were favored by at least 40 per cent.

s; ---; 1-only; 155 institutions; 1.6, 1.7, 2.6; pre-service; ---;

non-norm; ---.

Other References

Brown, J. A. & Mayor, J. R., 1961	(r-2)
Brydegaard, 1960	(a-4)
Jones, P. S. & Coxford, A. F., Jr., 1964	(r-2)

[No research reports were assigned to this category.]

Pre-service:
Characteristics (t-1d)

[No research reports were assigned with a primary reference to this category.]

Other References

Maul, 1955	(t-2d)
Maul, 1958	(t-2d)

Guiler, Walter Scribner. Computational Errors Made By Teachers of Arithmetic. El. Sch. J. 33: 51-58; Sept. 1932.

This study investigated the computational errors made by teachers, and tabulated the findings.

s; ---; 1-only; 37 teachers; ---; in-service (elem. and sec.); ---;

---; ---.

In-service: Competency levels (t-2a)

Cronbach, Lee J. What the Word "Function" Means to Algebra Teachers. Math. Teach. 36: 212-218; May 1943. (c-17)

Teachers of advanced algebra varied widely in stating what can be called a function and what cannot.

s; ---; 2-r; 41 teachers; ---; in-service; ---; non-norm; ---.

Dye, David L. Status of Mathematics Education in Minnesota Schools. 1966. (ERIC Document No. ED 018 394) (t-2c)

Many teachers were not ready to introduce contemporary material; they did not feel secure with their mathematics competence.

s; ---; ---; ---; 1.6; in-service (elem. and sec.); ---; ---; ---.

Easterday, Kenneth. Study of Mathematics Teachers in Alabama. 1967. (ERIC Document No. ED 014 454)

Data on both secondary and elementary teachers were presented. Almost half of the secondary teachers had not majored in mathematics, while one-third with a mathematics major taught other courses. About 40 per cent had attended NSF programs.

s; ---; ---; ---; 1.6; in-service (elem. and sec.); ---; ---; ---.

Gundlach, W. B. An Investigation of Mathematics Teachers in Minnesota. Math. Teach. 34: 258-265; Oct. 1941.

Wide variations were found in training, experience, number and kinds of classes taught, enrollment in classes in various grades, and practices in different types of schools.

s; ---; ---; 1007 teachers (474 schools); 1.3, 1.4; in-service; ---; ---; ---.

Layton, W. I. The Certification of Teachers of Mathematics. Math. Teach. 42: 377-380; Dec. 1949.

A survey of state requirements for teaching mathematics in elementary and secondary schools was summarized.

s; ---; ---; ---; ---; in-service (elem. and sec.); ---; ---; ---.

Lyng, Merwin J. Factors Relating to a Teacher's Knowledge of Contemporary Mathematics. Math. Teach. 61: 695-697; Nov. 1968.

Teachers' mathematical knowledge tended to increase as such factors as mathematical reading comprehension, background, and age increased.

s; ---; 1-only; 127 teachers; 6.2; in-service; ---; non-norm; ---.

Rausch, Oscar P. The Retention by Teachers of Computational Skills in Arithmetic. Math. Teach. 40: 178-179; Apr. 1947.

Range of scores was from 12 to 65 (100%), with a mean of 44. Mathematics teachers had a mean of 58. Incorrect answers were primarily from computational errors.

s; ---; ---; 169 teachers; ---; in-service (elem. and sec.); ---;

norm; ---.

Reys, R. E.; Kerr, R. D.; and Alspaugh, J. W. Mathematics Training of Secondary Mathematics Teachers. Am. Math. Monthly 76: 933-937; Oct. 1969.

The mean number of semester hours of mathematics of the teachers was about 36. Teachers in rural and in suburban/urban districts differed significantly in amount of preparation.

s; ---; 2-r; 233 teachers; 1.4, 1.6, 3.2, 3.3; in-service; ---; ---;

---.

Spaney, Emma. The Performance of the Mathematics Candidates in the 1940 National Teacher Examinations. Math. Teach. 34: 8-11; Jan. 1941. (f-1b)

Mathematics candidates were superior to the average of the whole group of candidates in non-verbal reasoning, mathematics in general culture, and professional information sections of the test. A wide range of mastery of mathematics was evident.

s; ---; 1-only; 463 teachers; 1.1, 1.3; in-service; ---; norm; ---.

In-service: Competency levels (t-2a)

Other References

Glennon, 1949	(b-4)
Glennon, Winter 1949	(b-4)
Sarner & Frymier, June 1959	(t-1b)
Sarner & Frymier, Dec. 1959	(t-1b)
Stoneking & Welch, 1961	(f-1b)

Beberman, Max and Van Horn, Charles. A Study to Determine the Relative Effectiveness of the Use of a Series of Filmed Demonstrations in Teacher Education for a New High School Mathematics Curriculum. 1960. (ERIC Document No. ED 003 502) (c-22, d-4, d-9, f-4)

Forecasts of difficulty of teaching subject units were more effectively made by film-trained than by demonstration-trained teachers. Only one of 21 comparisons of student achievement showed significant differences.

(I) use of films or demonstrations in in-service training.
(D) attitude of teachers; achievement of students.

a; ---; 1-only; 34 teachers; ---; gr. 9, in-service; 1 yr.; non-norm; ---.

Heiges, J. S. How Many and What Subjects Should a High-School Teacher in Pennsylvania Be Prepared To Teach? Sch. R. 38: 286-299; Apr. 1930. (a-1, t-2d)

Teachers in 1926-7 usually taught one subject (71%) or two (26%) in four-year schools, but frequently three subjects (44%) in three-year schools.

s; ---; 2-s; 8197 teachers (867 schools); 1.6; in-service; ---; ---; ---.

Hively, Wells, II. Programmed Correspondence Courses in Algebra and Geometry for Inservice Teacher Training: Field Studies. Final Report. Aug. 1968. (ERIC Document No. ED 025 430) (d-9, f-4)

A relationship was found between gains of classes and general measures of teachers' subject-matter competence.

(I) training on new programs. (D) teacher and student achievement.

a; ---; 1-only; ---; ---; grs. 9, 11, in-service; ---; ---; ---.

Kennedy, Joseph. Administrative Practices in Secondary Mathematics Curriculum Experiments. Sch. Sci. Math. 61: 34-38; Jan. 1961.

Few teachers reported aid in planning or changes resulting from curriculum experimentation.

In-service procedures (t-2b)

s; ---; 1-only; 28 teachers; ---; in-service; ---; ---; ---.

Richtmeyer, Cleon C. A Course in Applied Mathematics for Teachers of Secondary Mathematics. *Math. Teach.* 31: 51-62; Feb. 1938. (a-2, b-3)

Most of the educators surveyed agreed that a course in mathematics which stresses applications was needed by teachers. An outline for the course was developed from topics considered important by secondary teachers.

s; ---; 2-s; 318 educators; 1.6; in-service; ---; ---; ---.

Romine, Stephen. Subject Combinations and Teaching Loads in Secondary Schools. *Sch. R.* 57: 551-558; Dec. 1949. (t-2d)

Only mathematics was taught by 46 per cent of the teachers, and two fields by 37 per cent.

s; ---; 1-only; 251 teachers; 1.6, 1.8; in-service; ---; ---; ---.

Other References

Anderson, E. W. & Eliassen, R. H., 1931	(r-2)
Bompart, 1970	(t-1b)
Brandenburg, 1967	(a-7)
Davison & Patrick, 1963	(t-1b)
Goff, 1968	(t-1b)
Kennedy, J. W., 1963	(t-1b)
Schlessinger & Helgeson, 1969	(r-2)

Boyer, Lee Emerson. The Utility of Analytic Geometry Concepts to Secondary School Teachers of Mathematics, Science and Industrial Arts. J. Exp. Ed. 5: 356-367; June 1937. (c-23)

Most teachers felt that analytic geometry was useful to teachers. "Index values" for 83 geometry items were presented for each type of teacher.

s; ---; 2-s; 104 teachers; 1.3, 6.4; in-service; ---; ---; ---.

Brown, Kenneth E. Why Teach Geometry? Math. Teach. 43: 103-106; Mar. 1950. (a-5i, c-23)

Opinions of teachers of mathematics regarding objectives in teaching geometry were summarized.

s; ---; ---; 500 teachers; ---; in-service; ---; ---; ---.

Grove, Ethel L. Are We Teaching Students or Textbooks? Sch. Sci. Math. 50: 430-434; June 1950. (d-1)

Teachers' opinions regarding textbook use were summarized.

s; ---; ---; 52 teachers; ---; in-service; ---; ---; ---.

Leissa, Arthur W. and Fisher, Robert C. A Survey of Teachers' Opinions of a Revised Mathematics Curriculum. Math. Teach. 53: 113-118; Feb. 1960. (b-3)

Responses from symposium participants indicated general agreement with a report on a program for college preparatory mathematics.

s; ---; 1-only; 186 teachers; 1.6; in-service college professors;

---; ---; ---.

Mayor, J. R. Would Contests and Scholarships Contribute to Increased Interest in Mathematics? Math. Teach. 42: 283-289; Oct. 1949. (g-5)

A survey of contests and scholarships available in mathematics and opinions of educators regarding them were presented.

s; ---; 1-only; 54 educators; ---; in-service; ---; ---; ---.

In-service: Attitudes (t-2c)

Rising, Gerald R. and Ryan, James J. Participant Teacher Judgments of Experimental Programs in Secondary Mathematics. Aug. 1966. (ERIC Document No. ED 011 942) (a-6, d-9, g-5)

Teachers reacted more positively to the instructional effectiveness of experimental programs than to conventional materials. They perceived high ability students as responding more favorably to experimental materials and low ability, to conventional materials.

s; ---; 1-only; ---; ---; teachers in grs. 7-11; 1 yr.; ---; ---.

Other References

Dye, 1966	(t-2a)
Hess, 1955	(c-23)
Thacker & Read, 1949	(t-1b)

Berger, Raymond M. *A Study of the Attributes of Applicants to National Science Foundation Summer Institutes in 1964*. Aug. 1965. (ERIC Document No. ED 011 856)

Selection of participants was strongly influenced by the applicant's undergraduate major and grades, as well as by professional activities, highest degree earned, graduate grades, and teaching assignment.

s; ---; ---; ---; 1.6, 2.6; in-service; ---; ---; ---.

Brown, Kenneth E. Qualifications and Teaching Loads of Mathematics and Science Teachers. *Am. Math. Monthly* 67: 684-686; Sept. 1960.

Seven per cent of the mathematics teachers surveyed were without preparation in mathematics; the average was 23 hours.

s; ---; 2-s; 1393 teachers; 1.6; in-service; ---; ---; ---.

Chapin, June R. Patterns of Characteristics of Successful Mathematics Teachers and Those Who Leave the Profession: A Case Study. *Math. Teach*. 63: 159-163; Feb. 1970. (ERIC Document No. EJ 035 713; ED 017 011)

Few characteristics were found to contribute significantly to the effectiveness-score, though patterns of four groups could be discriminated. The pattern of teachers who left the profession was close to that of successful teachers.

s; ---; 2-s, 3-s; 95 teachers; 1.6, 3.12; teachers in grs. 7-12;

---; ---; ---.

Dessart, Donald J. Characteristics and Service Loads of Mathematics and Science Teachers. *Am. Math. Monthly* 71: 550-552; May 1964.

Forty per cent of the teachers in grades 7-8 and ten per cent of those in grades 9-12 had minimal training. Other data on courses taught by those at various levels of training were presented.

s; 2-s; ---; 1782 teachers; 1.6; in-service; ---; ---; ---.

In-service:
Characteristics (t-2d)

Filk, Anna and Douglass, Harl R. Classroom Practices of High School Teachers of Mathematics. Math. Teach. 32: 223-226; May 1939.

Practices named by teachers were cited.

s; ---; 1-only; 204 teachers; 1.6; in-service; ---; ---; ---.

Houston, Samuel R. and Bentzen, Mary M. Teaching Effectiveness in Culturally Deprived Junior High Mathematics Classes. J. Exp. Ed. 38: 73-78; Fall 1969. (ERIC Document No. EJ 010 644) (f-4)

Teacher characteristics contributed significantly to judgments made by observers using a specified technique, but student characteristics did not make a significant contribution for the evaluation of teaching effectiveness.

r; ---; 1-only; 13 teachers; 1.6, 3.13, 6.4; teachers in gr. 7; ---; ---; ---.

Kerr, R. D.; Alspaugh, John W.; and Reys, Robert E. A Study of Selected Characteristics of Secondary Mathematics Teachers. Sch. Sci. Math. 69: 781-790; Dec. 1969. (ERIC Document No. EJ 013 951)

Many teachers in Missouri were found to have inadequate levels of preparation, though urban and suburban teachers made more attempts to improve their background than did rural teachers.

s; ---; 2-r; 233 teachers; 1.3, 1.4, 1.6; in-service; ---; ---; ---.

Maul, Ray C. Where Do Eligible Mathematics Teachers Go? Math. Teach. 48: 397-400; Oct. 1955. (t-1d)

In 1954, only slightly over half of the mathematics education majors actually entered teaching.

s; ---; ---; ---; 1.1, 1.6; pre- and in-service; ---; ---; ---.

Maul, Ray C. Let's Look at the New Mathematics and Science Teachers. Math. Teach. 51: 531-534; Nov. 1958. (t-1d)

Data on the number of students preparing for and entering teaching were presented.

s; ---; ---; ---; 1.1, 1.6; in-service; ---; ---; ---.

Mills, Thomas J. Secondary School Science and Mathematics Teachers, Characteristics and Service Loads. 1963. (ERIC Document No. ED 030 573)

Data and recommendations on course load and in-service programs were presented.

s; ---; 2-r; 3012 teachers; ---; in-service; ---; ---; ---.

Norton, Monte S. Teacher Load in Science and Mathematics. Sch. Sci. Math. 60: 108-112; Feb. 1960.

The median load for mathematics teachers was approximately 30 hours, close to the median for all subject areas.

s; ---; 2-s; 363 teachers; 1.3, 1.8; in-service; ---; ---; ---.

Romine, Stephen. Improving Teaching Combinations and Assignments in Secondary Schools. Sch. R. 54: 537-544; Nov. 1946.

Data on the frequency with which mathematics courses were taught by teachers also teaching other courses were presented.

s; ---; 2-s; 229 schools; 1.1, 1.6; in-service; ---; ---; ---.

Torrance, E. Paul; et al. Characteristics of Mathematics Teachers That Affect Students' Learning. 1966. (ERIC Document No. ED 010 378)

If teachers met minimum qualifications, higher qualifications in these areas made no difference: length of experience, undergraduate and graduate courses and grades, and participation in mathematics organizations. The most effective teacher had a greater variety of ideas indicative of success and failure in their teaching, and produced a greater variety of alternative ways of teaching.

s; ---; ---; 127 teachers; ---; teachers in grs. 6-12; ---; ---;

---.

In-service:
Characteristics (t-2d)

Other References

Anderson, E. W. & Eliassen, R. H., 1931	(r-2)
Brown, K. E., Jan. 1960	(r-2)
Douglass & Olson, 1937	(e-6)
Dunn, 1937	(f-2c)
Fey, Oct. 1969	(r-2)
Heiges, 1930	(t-2b)
Pella, 1965	(a-7)
Romine, 1949	(t-2b)
Rosenbloom, *et al*., 1966	(f-4)
Skager, 1969	(a-5i)

The following journals have contained annual listings of reports of research on secondary school mathematics.

Journals	Volumes	Years	Authors	Types	Levels
Arithmetic Teacher	4-14	1957-67	Weaver	articles, dissertations	K-8
	15-16	1968-69	Riedesel and others		
	17	1970	Suydam		
Investigations in Mathematics Education	2-3	1969-70	Weaver	articles dissertations	K-college
Journal for Research in Mathematics Education	2	1971	Suydam and Weaver	articles, dissertations	K-12
School Review	41-47	1933-39	Breslich	articles	7-12
	48-64	1940-56	Hartung and/or Hawkins		
School Science and Mathematics	61-67	1961-67	Summers and others	dissertations	K-12
	68-71	1968-71	Mangrum and others		

Summaries and reviews (r-2)

Aiken, Lewis R., Jr. Attitudes Toward Mathematics. In *Reviews of Recent Research in Mathematics Education*, SMSG Studies in Mathematics, Vol. 19. (James W. Wilson and L. Ray Carry, Editors.) Stanford, California: Stanford University, 1969. pp. 1-49. (a-6)

Aiken, Lewis R., Jr. Nonintellective Variables and Mathematics Achievement: Directions for Research. *J. Sch. Psychol.* 8: 28-36; Mar. 1970. (a-6, e-5)

Aiken, Lewis R., Jr. Attitudes Toward Mathematics. *R. Ed. Res.* 40: 551-596; Oct. 1970. (a-6)

Anderson, Earl W. and Eliassen, R. H. High School Mathematics Teachers in the United States. *Math. Teach.* 24: 409-413; Nov. 1931. (t-2b, t-2d)

Bernstein, Allen. Library Research--A Study in Remedial Arithmetic. *Sch. Sci. Math.* 59: 185-195; Mar. 1959. (e-1b, e-2)

Bernstein, Allen L. Recent Research in Mathematics Teaching. *Mich. Ed. J.* 40: 262, 273; Nov. 1962.

Bittinger, Marvin L. A Review of Discovery. *Math. Teach.* 61: 140-146; Feb. 1968. (a-4, g-4)

Blank, Laura. The Respective Abilities of Boys and Girls in Learning Geometry. *Sch. Sci. Math.* 33: 129-133; Feb. 1933. (c-23, e-6)

Briggs, Leslie J. and Angell, David. Programed Instruction in Science and Mathematics. *R. Ed. Res.* 34: 354-373; June 1964. (d-5)

Brown, John A. and Mayor, John R. The Academic and Professional Training of Teachers of Mathematics. *R. Ed. Res.* 31: 296-304; June 1961. (t-1b)

Brown, Kenneth E. Research in Mathematics Education. *Math. Teach.* 46: 594-597; Dec. 1953.

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Summaries and reviews (r-2)

Brown, Kenneth E. Teaching Load and Qualifications of Mathematics Teachers. *Math. Teach.* 53: 2-11; Jan. 1960. (t-2d)

Brown, Kenneth E. and Abell, Theodore L. *Analysis of Research in the Teaching of Mathematics, 1965.* Bulletin No. 28. Washington, D.C.: U.S.O.E.; 1965. 99 pp.

Brown, Kenneth E. and Abell, Theodore L. Research in the Teaching of High School Mathematics. *Math. Teach.* 59: 53-57; Jan. 1966.

Brown, Kenneth E. and Abell, Theodore L. Trends in Mathematics Offerings and Enrollments. *Math. Teach.* 59: 652-655; Nov. 1966. (b-3)

Brown, Kenneth E. and Kinsella, J. J. *Analysis of Research in the Teaching of Mathematics, 1957 and 1958.* Bulletin No. 8. Washington, D.C.: U.S.O.E.; 1960. 50 pp.

Brown, Kenneth E.; Kinsella, John; Fehr, Howard; Myers, Sheldon; and Weaver, Fred. *Analysis of Research in the Teaching of Mathematics, 1959 and 1960.* Bulletin No. 12. Washington, D.C.: U.S.O.E.; 1963. 69 pp.

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Buell, Robert R. Mathematics Education Research in Sweden. *Sch. Sci. Math.* 63: 241-244; Mar. 1963. (a-7)

Burns, Paul C. and Dessart, Donald J. A Summary of Investigations Relating to Mathematics in Secondary Education: 1964. *Sch. Sci. Math.* 66: 73-80; Jan. 1966. (r-1)

Dessart, Donald J. Mathematics in the Secondary School. *R. Ed. Res.* 34: 298-312; June 1964.

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Douglass, Harl R. Psychology and Methods in the High School and College: Mathematics. *R. Ed. Res.* 4: 479-488, 531-533; Dec. 1934.

Douglass, Harl R. The Prediction of Success in High School Mathematics. *Math. Teach.* 28: 489-504; Dec. 1935. (c-21, c-22, f-2c)

Douglass, Harl R. Permanency of Retention of Learning in Secondary-School Mathematics. *Math. Teach.* 29: 287-288; Oct. 1936. (g-2)

Summaries and reviews (r-2)

Douglass, Harl R. Experimental Studies of Large Unit and Individualized Plans of Supervised Study of Secondary School Mathematics. Math. Teach. 29: 387-389; Dec. 1936. (a-4, e-4)

Douglass, Harl R. and Kinney, Lucien B. Prediction of Achievement in Mathematics. R. Ed. Res. 8: 51-57, Feb. 1938. (f-2c)

DuBois, Philip H. and Feierabend, R. L. Psychological Problems and Research Methods in Mathematics Training. 1959. (ERIC Document No. ED 002 915) (g-4)

Estes, Ronald V. A Review of Research Dealing with Current Issues in Mathematics Education. Sch. Sci. Math. 61: 623-630; Nov. 1961.

Feierabend, R. L. Review of Research on Psychological Problems in Mathematics Education. In Research Problems in Mathematics Education. U.S. Office of Education, Cooperative Research Monograph No. 3, 3-46, 1960.

Fey, James. Classroom Teaching of Mathematics. R. Ed. Res. 39: 535-551; Oct. 1969. (ERIC Document No. EJ 012 533) (t-2d)

Fey, James T. Classroom Teaching of Mathematics. In Reviews of Recent Research in Mathematics Education, SMSG Studies in Mathematics, Vol. 19. (James W. Wilson and L. Ray Carry, Editors.) Stanford, California: Stanford University, 1969. pp. 59-92.

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Kieren, Thomas E. Activity Learning. *R. Ed. Res.* 39: 509-522; Oct. 1969. (a-4, d-3, g-4)

Kilpatrick, Jeremy. Problem Solving in Mathematics. *R. Ed. Res.* 39: 523-534; Oct. 1969. (a-5b)

Kilpatrick, Jeremy. Problem-Solving and Creative Behavior in Mathematics. In *Reviews of Recent Research in Mathematics Education*, SMSG Studies in Mathematics, Vol. 19. (James W. Wilson and L. Ray Carry, Editors.) Stanford, California: Stanford University, 1969. pp. 153-187. (a-5b, g-4)

King, Bruce W. On Scrambling Instructional Stimuli. *J. Res. Math. Ed.* 1: 233-240; Nov. 1970. (d-5, g-4)

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43: 410-413; May 1950.
44: 52-53; Oct. 1951.
44: 426-428; Mar. 1951.
44: 518-519; Apr. 1951.
45: 203-204; Dec. 1952.
45: 531-532; Apr. 1952.
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Meconi, L. J. The Mathematically Gifted Student and Discovery Learning. *Math. Teach.* 60: 862-865; Dec. 1967. (a-4, e-3)

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APPENDIX A

CATEGORIES AND CODING FOR MATHEMATICAL TOPIC

a. Planning for instruction

1. Historical developments
2. Nature, values, and uses of mathematics
3. Organizational patterns (departmentalized; multi-graded; self-contained; non-graded; team teaching)
4. Teaching approaches (modern, traditional; expository, discovery; rote, meaning; incidental, systematic; activity, mathematics laboratory; aptitude-treatment interaction)
5. Instructional procedures
    a. Drill and practice
    b. Problem solving
    c. Estimation
    d. Mental computation
    e. Homework and supervised study
    f. Review
    g. Checking
    h. Writing and reading numerals
    i. Specification of objectives
6. Attitude, self-concept, and climate
7. International comparisons

b. Content: sequencing and structuring

1. Pre-first grade concepts
2. Readiness
3. Content organization and inclusion
4. Quantitative understanding
5. Grade placement
6. Time allotment

c. Content: methods of instruction

1. Counting
2. Number properties and relations
3. Whole numbers
    a. Addition
    b. Subtraction
    c. Multiplication
    d. Division
4. Fractions
    a. Addition
    b. Subtraction
    c. Multiplication
    d. Division

5. Decimals
6. Percentage
7. Ratio and proportion
8. Measurement
9. Negative numbers (integers)
10. Algebra in elementary school
11. Geometry in elementary school
12. Sets
13. Logic and proofs
14. The decimal numeration systems
15. Other numeration systems
16. Probability and statistics
17. Functions; graphing
18. (Unassigned)
19. (Unassigned)
20. Basic arithmetic procedures in secondary school
21. General Mathematics course
22. Algebra course
23. Geometry course
24. Trigonometry course
25. Calculus course
26. Other courses
27. (Unassigned)
28. (Unassigned)
29. (Unassigned)
30. Other topics

d. Materials

1. Textbooks
2. Workbooks, other printed materials
3. Manipulative devices, games
4. Audio-visual devices
5. Programmed instruction
6. Computer-aided instruction
    a. Tutorial
    b. Non-tutorial
7. Readability and vocabulary
8. Quantitative concepts in other curricular areas
9. Developmental projects (SMSG, etc.)

e. Individual differences

1. Diagnosis
    a. Error analysis
    b. Diagnostic procedures

2. Remediation
    a. Low achiever, underachiever
    b. Slow learner
    c. Mentally retarded
    d. Tutoring
3. Enrichment
    a. Overachiever
    b. Acceleration
4. Grouping procedures (ability, homogeneous, individualized, flexible)
5. Physical, psychological, and/or social characteristics (anxiety)
6. Sex differences
7. Socioeconomic differences

f. Evaluating progress

1. Testing
    a. Analysis and validation of tests
    b. Status testing
2. Achievement evaluation
    a. Related to age
    b. Related to intelligence
    c. Related to prediction
3. Effect of parental knowledge
4. Effect of teacher background and characteristics

g. Learning theory

1. Transfer
2. Retention
3. Generalization
4. Thought processes (categorization, organization, creative and critical thinking, concept formation)
5. Motivation
6. Reinforcement
    a. Knowledge of results
    b. Other procedures
7. Piagetian concepts
    a. Conservation
        1) Development
        2) Training
        3) Relation to achievement
    b. Transitivity
    c. Classification and seriation
    d. Other

t. Teacher education

  1. Pre-service
    a. Competency levels
    b. Preparation procedures
    c. Attitudes
    d. Characteristics
  2. In-service
    a. Competency levels
    b. In-service procedures
    c. Attitudes
    d. Characteristics

p. Other post-secondary education

  1. Mathematical background
  2. College mathematics instruction
  3. Vocational training

m. Mathematics

  1. Philosophy and theory
  2. Persons and texts
  3. Topics (content)
  4. Other

r. References

  1. Bibliographical lists
  2. Summaries and reviews

APPENDIX B

CATEGORIES AND CODING FOR TYPE OF STUDY

d	Descriptive:	research in which the researcher reports on records which may have been kept by someone else; includes reviews, historical studies, and textbook analyses or comparisons
s	Survey:	research which attempts to find characteristics of a population by asking a sample through the use of a questionnaire or interview; includes also the status study, in which a group is investigated as it is to ascertain pertinent characteristics (measures assigned variable only)
c	Case study:	research in which the researcher describes in depth what is happening to one designated unit, usually one child
a	Action research:	research which uses nominal controls; generally teacher or school originated; procedures of actual practice may be described
r	Correlational:	research which studies relationships between or among two or more variables; uses correlational statistic primarily
f	Ex post facto:	research in which the independent variable or variables were manipulated in the past; the researcher starts with the observation of a dependent variable or variables. He then studies the independent variables in retrospect for their possible effects on the dependent variables. (He may examine interrelationships of two or more assigned variables or two or more levels of one assigned variable)
e	Experimental:	research in which the independent variable or variables are manipulated by the researcher to quantitatively measure their effect on some dependent variable or variables, to test a logically derived hypothesis

APPENDIX C

CATEGORIES AND CODING FOR DESIGN PARADIGM

1.1* One-shot study, no control group (posttest only)
1.2 One group pretest-posttest
1.3 Static group comparison

			to treatment	in analysis
2.1	Pretest-posttest	control group	matched	n = classes
2.2	"	"	"	n = students
2.3	"	"	randomized	n = classes
2.4	"	"	"	n = students
2.5	Posttest only	control group	matched	n = classes
2.6	"	"	"	n = students
2.7	"	"	randomized	n = classes
2.8	"	"	"	n = students
2.9	Pretest-posttest	three or more groups	matched	n = classes
2.10	"	"	"	n = students
2.11	"	"	randomized	n = classes
2.12	"	"	"	n = students
2.13	Posttest only	three or more groups	matched	n = classes
2.14	"	"	"	n = students
2.15	"	"	randomized	n = classes
2.16	"	"	"	n = students
2.17	Solomon's Four Group			
2.18	Pretest-posttest	own control	randomized	
2.19	Posttest only	own control	randomized	
3.1	Pretest-posttest	control group	matched	nc or uc**
3.3	"	"	randomized	nc or uc
3.4	"	"	insufficient information re n	
3.5	Posttest only	control group	matched	nc or uc
3.7	"	"	randomized	nc or uc
3.8	"	"	insufficient information re n	
3.9	Pretest-posttest	three or more groups	matched	nc or uc
3.11	"	"	randomized	nc or uc
3.12	"	"	insufficient information re n	
3.13	Posttest only	three or more groups	matched	nc or uc
3.15	"	"	randomized	nc or uc
3.16	"	"	insufficient information re n	
3.17	Solomon's Four Group			nc or uc
3.18	Pretest-posttest	own control	insufficient information re n	
3.19	Posttest only	own control	insufficient information re n	
3.21	Pretest-posttest	non-equivalent control group		
3.22	Posttest only	non-equivalent control group		
3.23	Pretest-posttest, separate sample			

3.25 Counterbalanced
3.27 Time series (repeated measures)
3.28 Equivalent time samples
3.29 Equivalent materials samples

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[*] r: placed after numeral to indicate retention test was administered.

[**] nc: not correct; n = students when sampling unit seems to be classes.
uc: uncertain which n was used in data analysis.

APPENDIX D

CATEGORIES AND CODING FOR STATISTICAL PROCEDURE

a. Descriptive types of measures
  1.1 Raw scores, frequency distributions
  1.2 Difference between scores
  1.3 Medians
  1.4 Means
  1.5 Difference between means or medians
  1.6 Percentages
  1.7 Proportions or ratios
  1.8 Quartiles
  1.9 Ranks
  1.10 Percentiles and deciles
  1.11 Q-Sort
  1.12 Standard scores

b. Inferential types of tests
  2.1 Chi square one-sample test ("goodness of fit")
  2.2 Contingency Coefficient
  2.3 Fisher's Exact Probability for 2 x 2 Tables
  2.4 McNemar's Test for Significance of Changes
  2.5 Cochran's Q Test for Several Related Proportions
  2.6 Chi square Test for Independence
  2.7 Methods for Maximizing Probability of Correct Classification
  2.8 McNemar's Test for Non-Independent Proportions
  2.9 Behrens-Fisher Test of Equality of Means on a Personality Test
  2.10 Tukey Gap Test
  2.11 Kolmogorov-Smirnov Two-Sample Test
  2.12 McCall's T-Scale

  3.1 Pearson's Resolution of Mixed Gaussian Series
  3.2 Analysis of Variance
  3.3 F-test
  3.4 t-test
  3.5 Analysis of Covariance (including multivariate)
  3.6 Scheffe's Multiple Comparison Procedure
  3.7 Tukey's Multiple Comparison Procedure
  3.8 Hotelling's T
  3.9 Mahalonobis' D^2
  3.10 Fisher's Discriminant Function
  3.11 Rao's V_k
  3.12 Multiple Discriminant Analysis
  3.13 Multiple Regression Analysis
  3.14 Multiple Discriminant Function
  3.15 z-test, Critical Ratio
  3.16 Cochran-Cox test
  3.17 Probable error

3.18 Probable error ratio
3.19 Welch-Nayer test for homogeneity of variability
3.20 Duncan's Multiple Range Test (Kramer's extension)
3.21 Newman-Keuls Multiple Comparison

4.1 Sign test
4.2 Median test
4.3 Mann-Whitney U Test
4.4 Kruskal-Wallis One-way AOV
4.5 Friedman's Two-way AOV
4.6 Wilcoxon's Matched-pairs Signed-ranks Test
4.7 Wilcoxon's Test of Significance for Unpaired Replicates
4.8 Scalogram analysis

5.1 Kendall's Coefficient of Concordance (W)
5.2 Spearman's Rank Correlation (rho)
5.3 Kendall's Rank Correlation (tau)
5.4 Cattell's Coefficients of Pattern Similarity

6.1 Factor analysis
6.2 Regression analysis (including 'stepwise')
6.3 Multiple correlation
6.4 Correlation
6.5 Phi coefficient
6.6 Wherry Doolittle Test Selection Method (for multiple correlation)
6.7 Johnson-Neyman Technique

APPENDIX E

INSTRUMENT FOR EVALUATING EXPERIMENTAL RESEARCH REPORTS

Directions:

Evaluate with the nine underlined questions which follow. The quality of the research report in terms of each question should be rated on a five-point scale. The specifications for these five points are:

1) Excellent:	all requirements for the question are met; nothing essential could be added
2) Very good:	most requirements are met
3) Good:	some requirements are met
4) Fair:	a few requirements are met
5) Poor:	none or too few of the requirements are met

Certain "key points" should be considered in ascertaining a rating for each question. These are listed below the question, followed by adjectives which indicate the continuum on which the "key point" should be assessed. Do NOT make a response to these "key points". They are intended to focus the attention of all raters on the same pertinent aspects of each question.

Please make only nine responses for each article, one for each question.

Instrument for Evaluating Experimental Research Reports

Marilyn N. Suydam
The Pennsylvania State University

1. How practically or theoretically significant is the problem? (1-2-3-4-5)

a. Purpose	(important---non-important)
b. Problem origin	
1) Rationale	(logical---illogical)
2) Previous research	(appropriate---inappropriate)

2. How clearly defined is the problem? (1-2-3-4-5)

a. Question	(operational---vague)
b. Hypothesis(es)	(relevant---irrelevant)
	(logical---illogical)
c. Independent variable(s)	(relevant---irrelevant)
d. Dependent variable(s)	(operational---vague)
	(relevant---irrelevant)

3. How well does the design answer the research question? (1-2-3-4-5)

a. Paradigm	(appropriate---inappropriate)
b. Hypothesis(es)	(testable---untestable)
c. Procedures	(clear---unclear)
d. Treatments	(replicable---unreplicable)
	(appropriate---inappropriate)
e. Duration	(appropriate---inappropriate)

4. How adequately does the design control variables? (1-2-3-4-5)

a. Independent variable(s)	(uncontaminated---contaminated)
b. Administration of treatment	(rigorous---unrigorous)
c. Teacher or group factors	(controlled---uncontrolled)
d. Subject or experimenter bias	(controlled---uncontrolled)
e. Halo effect	(controlled---uncontrolled)
f. Extraneous factors	(controlled---uncontrolled)
g. Individual factors	(controlled---uncontrolled)

5. How properly is the sample selected for the design and purpose of the research? (1-2-3-4-5)

a. Population	(appropriate---inappropriate)
b. Drawing of sample	(random---unspecified)
c. Assignment of treatment	(random---unspecified)
d. Size	(appropriate---inappropriate)
e. Characteristics	(appropriate---inappropriate)

6. How valid and reliable are the measuring instruments or observational techniques? (1-2-3-4-5)

a. Instrument or technique	
1) Description	(excellent---poor)
2) Validity	(appropriate---inappropriate)
3) Reliability for population	(excellent---poor)
b. Procedure of data collection	(careful---careless)

7. How valid are the techniques of analysis of data? (1-2-3-4-5)

a. Statistical tests	
1) Basic assumptions	(satisfied---unclear)
2) Relation to design	(appropriate---inappropriate)
b. Data	
1) Treatment	(appropriate---inappropriate)
2) Presentation	(clear---unclear)
3) Level of significance	(appropriate---inappropriate) (specified---unspecified)
4) Discussion	(accurate---inaccurate)

8. How appropriate are the interpretations and generalizations from the data? (1-2-3-4-5)

a. Consistency with results	(excellent---poor)
b. Generalizations	(reasonable---exaggerated)
c. Implications	(reasonable---exaggerated)
d. Limitations	(noted---not noted)

9. How adequately is the research reported? (1-2-3-4-5)

a. Organization	(excellent---poor)
b. Style	(clear---vague)
c. Grammar	(good---poor)
d. Completeness	(excellent---poor) (replicable---unreplicable)

APPENDIX F

LIST OF ABBREVIATIONS FOR JOURNALS CITED

American Education	Am. Ed.
American Educational Research Journal	Am. Ed. Res. J.
American Journal of Mental Deficiency	Am. J. Ment. Def.
American Mathematical Monthly	Am. Math. Monthly
Arithmetic Teacher	Arith. Teach.
AV Communication Review	AV Comm. R.
Audiovisual Instruction	AV Inst.
California Journal of Educational Research	Calif. J. Ed. Res.
Catholic Education Review	Catholic Ed. R.
Chicago Schools Journal	Chicago Sch. J.
Child Development	Child Develop.
Clearing House	Clearing House
Contemporary Education	Contemp. Ed.
Education of the Visually Handicapped	Ed. Vis. Handicapped
Educational Administration and Supervision	Ed. Adm. & Sup.
Educational Method	Ed. Meth.
Educational Outlook	Ed. Outlook
Educational and Psychological Measurement	Ed. & Psychol. Meas.
Educational Research Bulletin	Ed. Res. B.
Elementary School Journal	El. Sch. J.
ERIC Documents	ERIC Documents
Exceptional Children	Excep. Child.

Graduate Research in Education and Related Disciplines	Grad. Res. in Ed. & Related Disciplines
Harvard Educational Review	Harvard Ed. R.
High Points	High Points
Indiana University School of Education Bulletin	Ind. U. Sch. Ed. B.
Journal of Applied Psychology	J. Appl. Psychol.
Journal of Clinical Psychology	J. Clin. Psychol.
Journal of Educational Measurement	J. Ed. Meas.
Journal of Educational Psychology	J. Ed. Psychol.
Journal of Educational Research	J. Ed. Res.
Journal of Experimental Child Psychology	J. Exp. Child Psychol.
Journal of Experimental Education	J. Exp. Ed.
Journal of Experimental Psychology	J. Exp. Psychol.
Journal of Genetic Psychology	J. Genet. Psychol.
Journal for Research in Mathematics Education	J. Res. Math. Ed.
Journal of Research Services	J. Res. Services
Journal of School Psychology	J. Sch. Psychol.
Journal of Social Psychology	J. Soc. Psychol.
Journal of Speech Disorders	J. Speech Dis.
Journal of Teacher Education	J. Teach. Ed.
Mathematics Teacher	Math. Teach.
Peabody Journal of Education	Peabody J. Ed.
Perceptual Motor Skills	Perceptual Motor Skills
Personnel and Guidance Journal	Personnel & Guid. J.

Pittsburgh Schools	Pittsburgh Sch.
Psychological Reports	Psychol. Reports
Psychology in the Schools	Psychol. in Sch.
School Board Journal	Sch. Bd. J.
School and Community	Sch. & Com.
School Executive	Sch. Exec.
School Review	Sch. R.
School Science and Mathematics	Sch. Sci. Math.
School and Society	Sch. & Soc.
Science Education	Sci. Ed.
Supplementary Educational Monographs	Suppl. Ed. Monog.
Teachers College Record	Teach. Col. Rec.
Texas Outlook	Tex. Outlook
Training School Bulletin	Training Sch. B.
Wisconsin Journal of Education	Wisc. J. Ed.

APPENDIX G

ALPHABETICAL LIST OF ARTICLES AND ERIC DOCUMENTS ON SECONDARY SCHOOL MATHEMATICS

Adams, Imogen and Cole, Robert D. An Analysis of Algebra Workbooks. *J. Ed. Res.* 26: 116-131; Oct. 1932. (d-2; c-22)

Addleston, Lorraine W. Remotivating Arithmetic Fundamentals in the Junior High School. *High Points* 25: 65-70; Mar. 1943. (a-5a; e-2)

Albers, Mary Elizabeth and Seagoe, May V. Enrichment for Superior Students in Algebra Classes. *J. Ed. Res.* 40: 481-495; Mar. 1947. (e-3; c-22)

Alexander, A. M. Teacher Judgment of Pupil Intelligence and Achievement is Not Enough. *El. Sch. J.* 53: 396-401; Mar. 1953. (f-4; f-2b)

Alexander, Vincent E. Seventh Graders' Ability to Solve Problems. *Sch. Sci. Math.* 60: 603-606; Nov. 1960. (a-5b)

Alexander, Vincent E. Sex Differences in Seventh Grade Problem Solving. *Sch. Sci. Math.* 62: 47-50; Jan. 1962. (e-6; a-5b)

Alkire, G. Don. Functional Competence in Mathematics. *J. Exp. Ed.* 22: 227-236; Mar. 1954. (f-2; c-20, e-6)

Allen, Robert W. The Fourth "R." *Calif. J. Ed. Res.* 16: 75-79; Mar. 1965. (c-13)

Alspaugh, John W. and Delon, Floyd G. How Modern Is Today's Secondary Mathematics Curriculum? *Math. Teach.* 60: 50-55; Jan. 1967. (b-3)

Alspaugh, John W.; Kerr, R. D.; and Reys, Robert E. Curriculum Change in Secondary School Mathematics. *Sch. Sci. Math.* 70: 170-176; Feb. 1970. (ERIC Document No. EJ 015 668) (a-1; b-3, b-5)

Amatora, Sister Mary. School Interests of Early Adolescents. *J. Genet. Psychol.* 98: 133-145; Mar. 1961. (a-6; e-6)

Amidon, Edmund and Flanders, Ned A. The Effects of Direct and Indirect Teacher Influence on Dependent-Prone Students Learning Geometry. *J. Ed. Psychol.* 52: 286-291; Dec. 1961. (a-4; a-6, c-23, f-4)

Anderson, Frank H.; Bedford, Fred; Clark, Van; and Schipper, Joan. A Report of an Experiment at Camelback High School. *Math. Teach.* 56: 155-159; Mar. 1963. (e-3b; c-22)

Anderson, George R. Visual-Tactual Devices and Their Efficacy. *Arith. Teach*. 4: 196-201; Nov. 1957. (d-3; a-6, c-8, d-4)

Anderson, George R. These Eighth Graders Don't Hate Arithmetic. *Math. Teach*. 51: 267-269; Apr. 1958. (a-6)

Anderson, George R. and VanderMeer, Abram W. A Comparative Study of the Effectiveness of Lessons on the Slide Rule Presented Via Television and in Person. *Math. Teach*. 47: 323-327; May 1954. (d-4; d-3)

Anderson, Kenneth E. and Dixon, Lyle J. A Study of the "Double Track" Program of Mathematics in the Secondary Schools of Kansas. *Sch. Sci. Math*. 52: 637-640; Nov. 1952. (f-1b; a-3, c-21, c-22)

Anttonen, Ralph G. A Longitudinal Study in Mathematics Attitude. *J. Ed. Res*. 62: 467-471; July/Aug. 1969. (ERIC Document No. EJ 007 271) (a-6)

Archer, N. Sidney and Woodlen, Milton C. *The Teacher, Programed Materials, and Instructional Interaction--An Assessment of Five Selected Conditions of Teacher and Program Integration. Final Report*. May 1967. (ERIC Document No. ED 019 009) (a-4; a-3, c-22, d-5)

Arends, Richard and Ford, Paul M. *Acceleration and Enrichment in the Junior High School: A Follow-Up Study*. July 1964. (ERIC Document No. ED 028 558; ED 001 220) (e-3b; e-3)

Armstrong, Clairette P. and Heisler, Florence. Some Comparisons of Negro and White Delinquent Boys. *J. Genet. Psychol*. 67: 81-84; Sept. 1945. (e-5; f-2)

Arthur, Lee E. Diagnosis of Disabilities in Arithmetic Essentials. *Math. Teach*. 43: 197-202; May 1950. (e-1a; f-1b)

Ashbaugh, W. H. Effect on Achievement of Written Responses to Programmed Learning Material for Students of Differing Academic Ability. *Psychol. Reports* 14: 780-782; June 1964. (d-5)

Austin, Gilbert R. *A Longitudinal Evaluation of Mathematical Computational Abilities of New Hampshire's Eighth Graders: 1963-1967. Final Report*. Aug. 15, 1969. (ERIC Document No. ED 039 147) (a-4; d-1, f-2)

Austin, John C. Mental Mathematics Counts. *Arith. Teach*. 17: 337-338; Apr. 1970. (ERIC Document No. EJ 018 789) (a-5d)

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Ayers, G. H. An Exploratory Course in Mathematics. *J. Appl. Psychol.* 18: 843-847; Dec. 1934. (f-2c; a-4, c-22, f-2)

Ayers, Jerry B.; Bashaw, W. L.; and Wash, James A. A Study of the Validity of the Sixteen Personality Factor Questionnaire in Predicting High School Academic Achievement. *Ed. & Psychol. Meas.* 29: 479-484; Summer 1969. (ERIC Document No. EJ 005 062) (e-5)

Bachman, Alfred Morry. The Relationship Between a Seventh-Grade Pupil's Academic Self-Concept and Achievement in Mathematics. *J. Res. Math. Ed.* 1: 173-179; May 1970. (a-6; f-3)

Bailey, Ralph G. The Effect on the Achievement in Physics of Drills on the Mathematical Skills Needed in High School Physics. *Sch. Sci. Math.* 35: 89-91; Jan. 1935. (d-8; a-5a)

Baker, Russell R. Program Provisions in Michigan Junior High Schools for Superior Students in Mathematics. *Math. Teach.* 55: 556-559; Nov. 1962. (e-3b; b-3)

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Baldauf, Robert J. Predicting Success in Eighth Grade Algebra. *Psychol. Reports* 12: 810; June 1963. (f-2c; c-22)

Baley, John D. and Benesch, Mary P. *A System for Individualized Math Instruction in Secondary Schools.* July 1969. (ERIC Document No. ED 050 555) (a-3)

Balow, Irving. The Effects of "Homogeneous" Grouping in Seventh-Grade Arithmetic. *Arith. Teach.* 11: 186-191; Mar. 1964. (e-4)

Banghart, Frank W. and Spraker, Harold S. Group Influence on Creativity in Mathematics. *J. Exp. Ed.* 31: 257-263; Mar. 1963. (g-4; c-14, c-15, d-9, e-4)

Barnes, Ward Ewing and Asher, John William. Predicting Students' Success in First-Year Algebra. *Math. Teach.* 55: 651-654; Dec. 1962. (f-2c; c-22)

Bassler, Otto C. *Comparison of Two Teaching Techniques in Elementary School Mathematics.* July 1968. (ERIC Document No. ED 023 595) (d-5; c-9, c-15)

Bauernfeind, Robert H. and Blumenfeld, Warren S. A Comparison of Achievement Scores of Public-School and Catholic-School Pupils. *Ed. & Psychol. Meas.* 23: 331-336; Summer 1963. (f-2)

Beane, D. G. A Comparison of Linear and Branching Techniques of Programed Instruction in Plane Geometry. J. Ed. Res. 58: 319-326; Mar. 1965. (d-5; c-23)

Beberman, Max and Van Horn, Charles. A Study to Determine the Relative Effectiveness of the Use of a Series of Filmed Demonstrations in Teacher Education for a New High School Mathematics Curriculum. 1960. (ERIC Document No. ED 003 502) (t-2b; c-22, d-4, d-9, f-4)

Beckmann, Milton W. How Mathematically Literate is the Typical Ninth Grader After Having Completed Either General Mathematics or Algebra? Sch. Sci. Math. 52: 449-455; June 1952. (f-2; c-21, c-22)

Beckmann, Milton W. Ninth Grade Mathematical Competence--15 Years Ago and Now. Sch. Sci. Math. 69: 315-319; Apr. 1969. (ERIC Document No. EJ 001 822) (f-2; a-1)

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Belcastro, Frank P. Programmed Learning and Intelligence. Sch. Sci. Math. 66: 29-36; Jan. 1966. (a-4; c-22, d-5, f-2b)

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Berger, Raymond M. A Study of the Attributes of Applicants to National Science Foundation Summer Institutes in 1964. Aug. 1965. (ERIC Document No. ED 011 856) (t-2d)

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Berglund-Gray, Gunborg and Young, Robert V. The Effect of Process Sequence on the Interpretation of Two-Step Problems in Arithmetic. J. Ed. Res. 34: 21-29; Sept. 1940. (a-5b; c-3)

Berlin, Sol. Probable Causes for Failure in Plane Geometry I in Townsend Harris Hall. High Points 14: 28-36; Mar. 1932. (f-2; c-23)

Berman, Linda. The High School Achievement of Former Two- and Three-Year Special Progress Junior High School Students. Grad. Res. in Ed. & Related Disciplines 1: 25-37; Nov. 1965. (e-3b; e-3)

Bernstein, Allen. A Study of Remedial Arithmetic Conducted with Ninth Grade Students. Sch. Sci. Math. 56: 25-31; Jan. 1956. (e-1a; e-2, f-1a)

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Bivens, Lyle W. Feedback Complexity and Self-Direction in Programmed Instruction. *Psychol. Reports* 14: 155-160; Feb. 1964. (g-6b; c-12, d-5)

Blackman, Leonard S. and Capobianco, Rudolph J. An Evaluation of Programmed Instruction with the Mentally Retarded Using Teaching Machines. *Am. J. Ment. Def.* 70: 262-269; Sept. 1965. (e-2c; d-5)

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Boe, Barbara L. *Secondary School Pupils' Perception of the Plane Sections of Selected Solid Figures.* Technical Report No. 13. Madison: Research and Development Center for Learning and Re-Education, University of Wisconsin, Nov. 1966. (ERIC Document No. ED 010 515) (c-23; g-7d)

Boe, Barbara L. A Study of the Ability of Secondary School Pupils to Perceive the Plane Sections of Selected Solid Figures. *Math. Teach.* 61: 415-421; Apr. 1968. (c-23; g-7d)

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Boss, Mabel E. Arithmetic, Then and Now. *Sch. & Soc.* 51: 391-392; Mar. 23, 1940. (f-1b)

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Brandenburg, W. J. Modernization of School Mathematics in Holland. *Am. Math. Monthly* 74: 57-60; Jan. 1967. (a-7; c-21, f-4, t-2b)

Brandes, Louis Grant. Using Recreational Mathematics Materials in the Classroom. *Math. Teach.* 46: 326-329; May 1953. (g-5)

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